IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:) Group Art Unit: 3752

DOUGLAS SWINGLEY) Examiner: Hook, James

Application No.: 10/631,382)

Filed: July 30, 2003)

For: CPVC DRAIN WASTE AND VENT FITTING)

OIPE IAP35 MAR 20 2006 PATENT & TRADEMARK OFFICE

DECLARATION OF DOUGLAS SWINGLEY UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

1. I, Douglas Swingley, declare that I am the Plant Engineer for Spears Manufacturing Company. I have 15 years of experience in the research, development, and testing of plastic pipe fittings and valves.

2. Attached hereto as Exhibit 1 to this Declaration is a true and complete copy of a printout made on February 13, 2006 of Spears' computer records relating to Purchase Order No. 0136012, which was the first order placed by Spears with one of its vendors for CPVC pipe to be sold with DWV fittings as the LABWASTE™ CPVC Corrosive Waste Drainage System. The first page of this printout indicates that the order was placed on August 30, 2002. I personally approved this order, and can verify the date indicated in the printout. The second page of the printout indicates the items ordered, namely CPVC pipe. Certain confidential information, including price and quantity information, has been crossed out in the attached copy.

3. When Spears launched the LABWASTE™ CPVC Corrosive Waste Drainage System, Spears did not manufacture CPVC pipes. Therefore, the pipes ordered in Purchase Order No. 0136012 were the first which could have been sold by Spears with the LABWASTE™ System. In addition, the first CPVC DWV fittings sold by Spears Manufacturing Co. were sold together with CPVC pipes as the LABWASTE™ System. Therefore, no LABWASTE™ System CPVC DWV fittings were sold by Spears prior to Spears' receipt of the CPVC pipes ordered in Purchase Order No. 0136012.

4. Further, attached hereto as Exhibit 2 is a copy of Spears' Purchase Order No. C0128154, dated May 3, 2002, which is the purchase order placed for the first brochure advertising the LABWASTE™ System and for the artwork for this brochure. No product advertising or offer for sale of the LABWASTE™ System occurred prior to this date.

5. Exhibits 3-5 attached hereto demonstrate the piping industry's understanding of the suitability of CPVC piping for transporting a variety of chemical agents. Exhibit 3 is a copy of a report concerning the suitability of several types of thermoplastic piping, including CPVC, with a variety of chemical agents. This report (available online at http://www.plasticpipe.org/pdf/pubs/ reports/tr19-00.pdf) was prepared by the Plastics Pipe Institute Inc. (PPI), a trade association representing all segments of the plastics piping industry. The report, dated January 2000, indicates that CPVC is not resistant to many solvents and corrosive chemicals.

6. Attached hereto as Exhibit 4 is a copy of a current brochure from Corzan Industrial Systems, a manufacturer of CPVC pipes and fittings, listing chemical resistance data for its CPVC piping products. This brochure is available online at http://www.corzancpvc.com/Brochures/ChemResistDataBrochure.pdf. Table I of this brochure indicates that CPVC pipe is not recommended for use with many chemicals (indicated with an "N" in the table).

7. Attached hereto as Exhibit 5 is a copy of a current brochure from Georgia Gulf Chemicals & Vinyls, LLC, also a manufacturer of CPVC pipe. Table 2 of this brochure likewise indicates that its ProTherm CPVC pipe is not recommended for use with many chemicals (indicated by "NR" in the table).

8. The PPI report and the Corzan and Georgia Gulf brochures reflect the industry's belief, both prior to the present invention and continuing to the present day, that CPVC piping is not compatible for use with many corrosive chemicals. As a result, prior to the present invention, CPVC fittings and pipes were not used to drain waste from laboratories and other settings where a variety of corrosive chemicals needed to be drained. CPVC piping was instead used only to conduct particular, identified chemical compounds in pressure piping applications.

9. Further evidence of the industry's belief, at the time the present invention was made, that CPVC piping is unsuitable for use in corrosive waste drainage applications can be found in documents issued by companies selling different corrosive waste drainage systems. These documents, attached hereto as Exhibits 6 and 7, have been distributed to customers of waste drainage systems by sales representatives of competitors of Spears Manufacturing Company.

10. Exhibit 6 is a memo dated 9/30/02 and issued by Orion Fittings, Inc. This memo restates the industry's belief that CPVC is not suitable for acid waste applications, in particular in research institutions (see, e.g., paragraph 1 of the memo). It also confirms that at the time the present invention was made CPVC was not listed for corrosive waste applications in any major plumbing code (paragraph 4). Contrary to the assertions made in this memo, our tests of CPVC piping have found that such piping is in fact resistant to the compounds listed in paragraph 1 of this memo when used in drainage applications. CPVC drainage piping has also now been: (1) certified for corrosive waste end use by NSF International in accordance with NSF standard 14; (2) certified for use in accordance with the Uniform Plumbing Code (UPC) by NSF International as specified in IAPMO Interim Guide Criteria IGC 210; and (3) approved for use in accordance with the

International Plumbing Code (IPC) by the International Codes Council Evaluation Services (ICC-ES), Evaluation Report ESR-1214. The suggestion in paragraph 2 of this memo that soap cannot be drained with CPVC piping is simply untrue.

11. Exhibit 7 is a letter issued by an employee of IPEX, Inc. on November 5, 2002. This letter makes assertions similar to those contained in Exhibit 6, and likewise states that the lower resistance of CPVC to certain chemicals makes it unsuitable for use in acid waste piping systems. The assertion in this letter that CPVC piping cannot withstand detergent drainage is incorrect.

12. Contrary to the understanding and expectations of the piping industry, we have found that CPVC fittings and pipes can in fact be successfully used to drain corrosive chemical compounds. The ability to drain such compounds without compromising the integrity of the CPVC piping is believed to be due at least in part to the fact that DWV fittings and associated pipes are designed to convey waste material through them, so that contact between the corrosive waste and the CPVC piping is limited. DWV fittings accomplish this through the use of sockets and/or bores which are pitched to "fall" or decline by at least about 1/4" per foot.

13. The wide variety of chemical compounds which can be drained with CPVC DWV fittings and pipe is set out in Spears Manufacturing Company's Technical Information & Installation Guide (Document No. LW-4-1205) for the LabWaste CPVC Corrosive Waste Drainage System. Pages 29-32 of this document, attached hereto as Exhibit 8, show chemical resistance tables for CPVC DWV fittings and pipe in drainage applications. The full document can be found online at http://www.plasticpipe.org/pdf/pubs/reports/tr19-00.pdf.

14. A partial list of corrosive chemicals which are not recommended for use with CPVC fittings and pipes by the PPI, Corzan Industrial Systems, and Georgia Gulf documents (Exhibits 3-5) but which have been found to be compatible when used with fittings and pipes made from CPVC in DWV applications is attached as Exhibit 9 hereto.

broad range of chemicals with which CPVC is compatible in DWV applications makes CPVC DWV fittings and pipes suitable for use in draining corrosive chemical waste.

I declare under penalty of perjury that the foregoing is true and correct, and that if called to testify thereto, I could and would so testify. All of the data provided and any statements made in this declaration are believed to be true. I further declare that I understand that willful false statements and the like are punishable by fine or imprisonment or both (18 U.S.A. § 1001) and may jeopardize the validity of the application or any patent issuing thereon.

Executed this 13 day of March, 2006, at SYLMAR, California.

Douglas Swingley

BLAKE PUR062S SPEARS MANUFACTURING COMPANY 2/13/06
QPADEV008N DISPLAY P.O. HISTORY HEADER RECORD DISPLAY 14:42:53

ORDER NUMBER : 0136012 RELEASE DATE : 8/30/02 CREATION DATE : 8/30/02
BUYER . . . . . : [redacted] DEPARTMENT CODE : PUR
VENDOR . . . . . : [redacted] PH#: [redacted]
CONTACT . . . . : VENDOR TERM : 2% 30 NET 30 DAYS
BILL TO : C SHIP TO : C

BILL TO	SHIP TO
SPEARS MANUFACTURING (CANEY)	SPEARS MANUFACTURING (CANEY)
(620) 879-2131	(620) 879-2131
RURAL ROUTE 1	RURAL ROUTE 1
CANEY	CANEY
KS 67333 0000	KS 67333 0000

PREVIOUS STATUS . . . : SHIP TO OVERRIDE CODE . . : N CLOSE TYPE . . : N

FOB CODE : CARRIER V1 VENDOR DELIVERY
TAX CODE : Z N/A FRT CODE B PREPAID/CHARGED
REQUESTER: [redacted]
APPROVAL : DOUG DOUG SWINGLEY APPROVED DATE 8/30/02
PURPOSE : Doug
P.O. CURRENCY RATE . . : 1.0000 UP TO DATE CURR. RATE : 1.0000
LAST DATE MAINTAINED : 10/10/02 USER LAST MAINTENANCE : [redacted]
F3=Exit F15=Vendor Override F17=Item Detail

[redacted] PUR063S SPEARS MANUFACTURING COMPANY 2/13/06
QPADEV008N P.O. HISTORY DETAIL BY ORDER DISPLAY 14:43:24
VENDOR: . . : [redacted] ORDER NO. . : 0136012
PART NUMBER DUE DATE

Type options, press Enter. N=Detail Note
5=View P.O. Detail Record 8=View Receiving Detail 9=View Detail Comments

?	PART NUMBER	DUE DATE	P/O REL	W H	QTY ORDERED	QTY OPEN	QTY RECEIVED	UNIT COST
	LW-015	9/13/02	1	C	[redacted]	0	[redacted]	[redacted]
_	PART DESC : 1-1/2 CPVC LABWASTE PIPE (10 FT LENGTH)							
	LW-020	9/13/02	2	C	[redacted]	0	[redacted]	[redacted]
_	PART DESC : 2 CPVC LABWASTE PIPE (10 FT LENGTH)							
	LW-030	9/13/02	3	C	[redacted]	0	[redacted]	[redacted]
_	PART DESC : 3 CPVC LABWASTE PIPE (10 FT LENGTH)							
	LW-040	9/13/02	4	C	[redacted]	0	[redacted]	[redacted]
_	PART DESC : 4 CPVC LABWASTE PIPE (10 FT LENGTH)							
	LW-060	9/13/02	5	C	[redacted]	0	[redacted]	[redacted]
_	PART DESC : 6 CPVC LABWASTE PIPE (10 FT LENGTH)							

F3=Exit

TO : SPEARS MANUFACTURING (CANEY)
P.O. BOX 9203
15853 OLDEN STREET
SYLMAR, CA 91342
ATTN : ACCOUNTS PAYABLE

'ENDOR NO [redacted]

VENDOR NAME [redacted]

PURCHASE ORDER

P.O. # C0128154 - 1
ORDER DATE: 5/03/02
DATE REQUIRED:

SHIP TO
SPEARS MANUFACTURING (CANEY)
(620) 879-2131
RURAL ROUTE 1
CANEY, KS 67333

CONFIRM TO	TERMS	REFERENCE	SHIP VIA
	NET 15		
BUYER	**REQUESTED BY**	**F.O.B.**	**FREIGHT TERMS**
NDY TAPIA	FELIPE NIEVES		VENDOR DELIVERY

	QTY ORDERED	ITEM NUMBER	DESCRIPTION	DUE DATE	UNIT COST	U/M	TAXABLE	EXTENSION
01		FILM CHARGES	NEW ARTWORK FOR; LW-2	5/06/02	[redacted]	EA	N	
02		LW-2	LABWASTE BROCH 0603 COATED, BOOK 6 PAGES, 4/COLOR,	5/03/02	[redacted]	EA	N	
			** END OF ORDER **		TAX.			.0
					TOTAL.			.0

URPOSE: new item,

VENDOR NOTE
This Company reserves the right to cancel this order if not delivered as specifi
Do not substitute any item without the Company's approval. If pricing will not
as shown, notify the Company immediately before filling order. Invoices receiv

TR-19/2000
Thermoplastics Piping for the Transport of Chemicals

THERMOPLASTIC PIPING FOR THE TRANSPORT OF CHEMICALS

Foreword

This report was developed and published with the technical help and financial support of the members of the PPI (Plastics Pipe Institute, Inc.). The members have shown their interest in quality products by assisting independent standards-making and user organizations in the development of standards, and also by developing reports on an industry-wide basis to help engineers, code officials, specifying groups, and users.

The purpose of this technical report is to provide information on the transport of various chemicals using thermoplastic piping materials.

This report has been prepared by PPI as a service of the industry. The information in this report is offered in good faith and believed to be accurate at the time of its preparation, but is offered without any warranty, expressed or implied, including WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Consult the manufacturer for more detailed information about the particular weathering package used for its piping products. Any reference to or testing of a particular proprietary product should not be construed as an endorsement by PPI, which do not endorse the proprietary products or processes of any manufacturer. The information in this report is offered for consideration by industry members in fulfilling their own compliance responsibilities. PPI assumes no responsibility for compliance with applicable laws and regulations.

PPI intends to revise this report from time to time, in response to comments and suggestions from users of the report. Please send suggestions of improvements to the address below. Information on other publications can be obtained by contacting PPI directly or visiting the web site.

The Plastics Pipe Institute
Toll Free: (888) 314-6774
http://www.plasticpipe.org

January 2000

CHEMICAL RESISTANCE IN GENERAL

Thermoplastic materials generally are resistant to attack from many chemicals which makes them suitable for use in many process applications. The suitability for use in a particular process piping application is a function of:

I. Material

A. The specific plastic material: ABS, CPVC, PP, PVC, PE, PB, PVDF, PEX[1], PA11, PK

B. The specific plastic material and its physical properties as identified by its cell classification according to the appropriate ASTM material specification.

II. Product and Joint System

A. Piping product dimensions, construction, and composition (layers, fillers, etc.).

B. Joining system. Heat fusion and solvent cementing do not introduce different materials into the system. Mechanical joints can introduce gaskets such as elastomers, or other thermoplastic or non-thermoplastic materials used as mechanical fitting components.

C. Other components and appurtenances in the piping system.

III. Use Conditions - *Internal and External*

A. Chemical or mixtures of chemicals, and their concentrations.

B. Operating temperature — maximum, minimum, and cyclical variations.

C. Operating pressure or applied stress — maximum, minimum and cyclical variations.

D. Life-cycle information — such as material cost, installation cost, desired service life, maintenance, repair and replacement costs, etc.

While the effect of each individual chemical is specific, some chemicals can be grouped into categories based on similar reactions. For example, water solutions of neutral inorganic salts generally have the same effect on thermoplastic piping materials as water alone, thus, sodium chloride, potassium alum, calcium chloride, copper sulfate, potassium sulfate and zinc chloride solutions have the same effect as water. However, at elevated temperatures and/or high concentrations, some oxidizing salt solutions may attack some specific plastic materials.

Further, with organic chemicals in a specific series such as alcohols, ketones, or acids, etc., as the molecular weight of the organic chemical series increases, the chemical resistance of a particular plastic material to members of the specific organic chemical series frequently also increases. Thus, while one type of

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[1] Once cross-linked, PEX is no longer considered a thermoplastic material; however, it is included in this report as convenience for the reader.

polyvinyl chloride at 73 °F is not suitable for use with ethyl acetate, it is suitable for the higher molecular weight butyl acetate.

Generally, the resistance of a particular plastic to a specific chemical decreases with an increase in concentration. For example, at 73 °F polyethylene pipe can be used to carry 70% sulfuric acid but is not satisfactory for 95% sulfuric acid. In some cases, combinations of chemicals may have a synergistic effect on a thermoplastic material where individual chemicals do not. Lastly, the resistance of a particular plastic to a specific chemical generally decreases with temperature increase, with stress increase, and decreases with cyclical variations of temperature or applied stress.

TYPES OF CHEMICAL ATTACK ON PLASTICS

In general, chemicals that affect plastics do so in one of two ways. One effect is chemical solubility or permeation. The other is direct chemical attack.

In the case of solubility or permeation, physical properties may be affected, but the polymer molecule structure itself is not chemically changed, degraded or destroyed. In solubility or permeation, gas, vapor, or liquid molecules pass through the polymer, typically without damaging the plastic material itself. If the solvating chemical can be removed completely, the plastic is generally restored to its original condition. However, it is not always possible to remove a solvating chemical from the plastic, and in such cases, effects relating to chemical solvation may be permanent.

Sometimes the polymer itself may not be soluble, but it may contain a compounding ingredient that may be soluble in the chemical, and may be extracted from the polymer compound. This is rare because such extractable ingredients are either not used in pipe compounds, or they are chemically bonded to the molecular polymer matrix, and in such small amounts that they cannot be leached out to any significant extent.

Permeation may do little if any harm to the material, but it may have application-related effects. The permeating chemical may transfer into a fluid on the other side of the pipe. In general, thermoplastic pipes should not be used where a permeating chemical could compromise the purity of a fluid such as potable water inside the pipe, and in gas or vapor transmission service, there may be a very slight loss of contents through the pipe wall. Lastly, a permeating chemical may be entrained in the material and be released when heat fusion or solvent cement joining is performed. Heat fusion or solvent cement joining may be unreliable if performed on permeated pipes.

Direct chemical attack occurs when exposure to a chemical causes a chemical alteration of the polymer molecules by chain scission, crosslinking, oxidation, or substitution reactions. Direct chemical attack may cause profound, irreversible changes that cannot be restored by removal of the chemical. Examples of this

type of attack are 50% chromic acid at 140 °F on PVC, aqua regia on PVC at 73 °F, 95% sulfuric acid at 73 °F on PE and wet chlorine gas on PVC and PE. Direct chemical attack frequently causes a severe reduction of mechanical physical properties such as tensile strength, ductility, and impact resistance, and susceptibility to cracking from applied stress (stress cracking).

However, direct chemical attack is not always detrimental. For example, PEX materials are deliberately crosslinked using chemical or irradiation methods. While crosslinking enhances certain mechanical properties of PEX materials, it may preclude the use of heat fusion to join PEX piping.

The chemical resistance of the various plastic types varies greatly from one plastic material to another (i.e., PVC, ABS, PE, etc.), and also among different cell classifications of the same plastic type (e.g. PVC 1120 to PVC 2110, PE 1404 to PE 3408, etc.). There may also be slight variations among commercial products having the same cell classification.

The chemical resistance of plastic piping is basically a function of the chemical resistance of the thermoplastic material, and processing of the plastic in such a way that its full chemical resistance is developed. In general, the less compounding ingredients used the better the chemical resistance. Most plastic pipe compounds covered by current ASTM specifications and product standards use a minimum of compounding ingredients, except for the Type II PVC's and CAB plastics. The Type II PVC's contain impact modifiers which are less susceptible to chemical attack than monomeric plasticizers such as those used in PVC cable insulation, film and sheeting compounds, and in CAB plastics. Thermoplastic pipes with significant filler percentages may be susceptible to chemical attack where an unfilled material may be affected to a lesser degree or not at all.

Some newer piping products utilize a multi-layered (composite) construction, that is, the pipe wall is constructed of layers of different materials. Both thermoplastic and non-thermoplastic materials are used for the layers. Examples are PE/AL/PE, and PEX/AL/PEX pipes where there is a mid-wall aluminum layer. An all thermoplastic composite pipe has PVC, ABS, and PVC layers. Layered composite material pipes may have chemical resistance that differs from the chemical resistance of the individual materials.

Chemicals that attack plastics do so at a certain rate, some slowly and some more quickly. But usually, any chemical attack is increased when temperature or stress are increased, or when temperature or stress are varied. The particular rate must be taken into consideration in the life-cycle evaluation for a particular application. It has been observed in some chemical plants that while a particular application may have a relatively short service life, the overall life-cycle cost may be economically feasible and justifiable. Each combination of material cost, installation cost and service life must be evaluated and judged on its own merits.

CHEMICAL RESISTANCE DATA FOR THERMOPLASTIC PIPING IN *NON-PRESSURE* (GRAVITY-FLOW) APPLICATIONS and DATA TABLE

When thermoplastic pipes come into contact with chemical agents, it is important to know how the pipe may be affected. For gravity flow or non-pressure applications, where the pipe Is not subject to continuous internal pressure or thermal stress, chemical immersion test data may provide suitable information. The pipe manufacturer may have additional information on similar testing, or information on previous installations under similar field conditions.

I. A thermoplastic pipe that is subjected to several chemicals may or may not be affected by the chemical combination. Chemicals that individually do not have an effect may affect the pipe if combined with certain other chemicals. The listings that follow do not address chemical combinations.

II. Layered composite piping may have chemical resistance that differs from that of the individual materials in the layers. The listings that follow are not applicable to layered composite piping products.

III. The listings that follow are not applicable to composite piping products such as reinforced epoxy resin (fiberglass) pipes, or to thermoplastic pipes containing significant percentages of filler materials.

IV. The following chemical resistance information has been obtained from numerous sources. It is based primarily on plastic material test specimens that have been immersed in the chemical, and to a lesser degree, on field-experience. In most cases, detailed information on the test conditions (such as exposure time), and on test results (such as change in weight, change in volume, and change in strength) were not available. Therefore, this information is best used only for comparison of different thermoplastic materials.

V. Where no concentrations are given, the relatively pure material is indicated, except in the case of solids where saturated aqueous solutions are indicated.

NOTE: *Even though indicated as acceptable with certain temperature limitations, the use of PVC piping with liquid hydrocarbons such as gasoline and jet fuels, should be limited to short-term exposure such as secondary containment systems. This piping is not recommended for long-term exposure to liquid hydrocarbons.*

Resistance Codes

The following code is used in the data table:

Code	Meaning	Typical Result
140	Plastic type is generally resistant to temperature (°F) indicated by code.	Swelling < 3% or weight loss < 0.5% and elongation at break not significantly changed.
R to 73	Plastic type is generally resistant to temperature (°F) indicated by code and may have limited resistance at higher temperatures.	Swelling < 3% or weight loss < 0.5% and elongation at break not significantly changed.
C to 73	Plastic type has limited resistance to temperature (°F) indicated by code and may be suitable for some conditions.	Swelling 3-8% or weight loss 0.5-5% and/or elongation at break decreased by < 50%.
N	Plastic type is not resistant.	Swelling > 8% or weight loss > 5% and/or elongation at break decreased by > 50%.
—	Data not available.	

Plastic Materials Identification

ABS	acrilonitrile-butadiene-styrene
CPVC	chlorinated polyvinyl chloride
PP	polypropylene
PVC	polyvinyl chloride
PE	polyethylene
PB	polybutylene
PVDF	poly vinylidene fluoride
PEX	crosslinked polyethylene
PA11	polyamide 11
PK	polyketone

CHEMICALS THAT DO NOT NORMALLY AFFECT THE PROPERTIES OF AN UNSTRESSED THERMOPLASTIC MAY CAUSE COMPLETELY DIFFERENT BEHAVIOR (SUCH AS STRESS CRACKING) WHEN UNDER THERMAL OR MECHANICAL STRESS (SUCH AS CONSTANT INTERNAL PRESSURE OR FREQUENT THERMAL OR MECHANICAL STRESS CYCLES).
UNSTRESSED IMMERSION TEST CHEMICAL RESISTANCE INFORMATION IS APPLICABLE ONLY WHEN THE THERMOPLASTIC PIPE WILL NOT BE SUBJECT TO MECHANICAL OR THERMAL STRESS THAT IS CONSTANT OR CYCLES FREQUENTLY.

WHEN THE PIPE WILL BE SUBJECT TO A CONTINUOUS APPLIED MECHANICAL OR THERMAL STRESS OR TO COMBINATIONS OF CHEMICALS, TESTING THAT DUPLICATES THE EXPECTED FIELD CONDITIONS AS CLOSELY AS POSSIBLE SHOULD BE PERFORMED ON REPRESENTATIVE SAMPLES OF THE PIPE PRODUCT TO PROPERLY EVALUATE PLASTIC PIPE FOR USE IN THIS APPLICATION.

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Acetaldehyde CH_3CHO		---	N	140	N	C to 73	C to 73	---	C to 140	C to 176	R to 73
	Aq. Of 40%	---	N	---	C to 73	R to 73	---	N	R to 73	---	---
Acetamide CH_3CONH2	5%	120	---	140	---	140	---	---	140	---	---
Acetic Acid CH_3COOH	vapor	120	180	180	140	140	140	---	140	---	---
	5%	---	---	---	---	---	---	---	---	---	R to 176
	10%	---	---	---	---	---	---	R to 248	140	R to 176	---
	25%	N	180	180	140	140	140	---	140	---	---
	40%	---	---	---	---	---	---	R to 140	R to 176	---	---
	50%	---	---	---	---	---	---	R to 140	R to 176	C to 68	---
	60%	N	N	180	73	73	73	R to 104	73	---	---
	80%	---	---	---	---	---	---	R to 104	---	---	---
	85%	N	N	120	73	73	73	---	73	---	---
	glacial	N	N	120	73	73	73	R to 104	R to 68	---	---
Acetic Anhydride $(CH_3CO)_2O$	---	N	N	73	N	73	140	N	73	C to 68	---
Acetone	5%	N	N	73	N	C to	140	R to	C to	C to	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
CH_3 $COCH_3$						73		212	73	140	
	10%	---	---	---	---	---	---	R to 122	---	---	---
	100%	---	---	---	---	---	---	---	---	---	R to 73 C to 122
Acetophenone C_6 H_5 $COCH_3$	---	N	---	120	--	73	---	R to	73 68	---	---
Acetyl Chloride CH_3 COCl	---	N	N	---	N	---	---	N	---	---	---
Acetylene HC=CH	gas 100%	73	N	73	N	73	C to 73	---	73	140	---
Acetylnitrile	---	---	N	---	N	---	---	---	---	---	---
Acrylic Acid H_2 C:CHCOOH	97%	---	N	---	N	140	---	---	140	---	---
Acrylonitrile H_2 C:CHCN	---	---	N	---	N	140	---	---	140	---	---
Adipic Acid COOH(CH_2)$_4$ COOH	sat'd	---	180	140	140	140	73	R to 176	140	---	---
Allyl Alcohol CH_2 = $CHCH_2$ OH	96%	---	C to 73	140	R to 73	140	140	---	N	---	---
H_2 Cl	--	---	N	---	N 73	C to	---	140	C to 73	---	---
	Liquid	---	---	---	---	---	---	R to 68	---	---	---
Aluminum Ammonium	sat'd	---	180	140	140	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sulfate (Alum) $AlNH_4(SO_4)_2\,12H_2O$											
Aluminum Chloride Aqueous $AlCl_2$	sat'd	160	180	180	140	140	140	R to 212	140	---	---
Aluminum Fluoride Anhydrous AlF_3	sat'd	160	180	180	73	140	140	R to 212	140	---	---
Aluminum Hydroxide $AlO_3\,O3H_2O$	sat'd	160	180	180	140	140	140	R to 212	140	---	N
Aluminum Nitrate $Al(NO_3)_3\,O9H_2O$	sat'd	---	180	180	140	140	140	R to 212	140	---	---
Aluminum Oxychloride	--	---	180	180	140	---	140	---	---	---	---
Aluminum Potassium Sulfate (Alum) $AlK(SO_4)_2\,o12H_2O$	sat'd	160	180	140	140	140	---	R to 212	140	---	---
Aluminum Sulfate (Alum)	sat'd	160	180	140	140	140	C to 73	R to 212	140	194	---
$Al_2(SO_4)_3$	20%	---	---	---	---	---	---	---	---	---	R to 73
Amonia Gas NH_3	100%	N	N	140	140	140	140	---	140	140	---
Amonia Liquid NH_3	100%	160	N	140	N	140	73	---	140	140	---
Amonia Acetate $NH4(C_2H_3O_2)$	sat'd	120	180	73	140	140	---	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Amonium Bifluoride NH_4HF_2	sat'd	---	180	180	140	---	140	---	140	---	---
Amonium Bisulfide $(NH_4)HS$	---	---	---	---	140	---	---	---	---	---	---
Amonium Carbonate $(NH_4)HCO_3o\ (NH_4)\ CO_2\ NH_2$	sat'd	---	180	212	140	140	140	R to 248	140	---	---
Amonium Chloride NH_4Cl	sat'd	120	180	212	140	140	140	R to 212	140	---	---
Amonium Dichromate $(NH_4)_2Cr_2O_7$	--	---	73	---	73	---	---	---	---	---	---
Amonium Fluoride NH_4F	10%	120	180	212	140	140	---	R to 212	140	---	---
	25%	120	180	212	C to 140	140	73	---	140	---	---
Amonium Hydroxide NH_4OH	10%	120	N	212	140	140	140	---	140	---	N
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
	Conc.	---	---	---	---	---	---	---	194	---	---
Amonium sphate	Sat'd	--	-- 212	R to 140	R to 140	R to 140	R to 248	R to	R to 140	---	---
Amonium Nitrate NH_4NO_3	sat'd	120	180	212	140	140	140	R to 212	140	---	---
Amonium Persulphate $(NH_4)_2S_2O_8$	---	---	180	140	140	140	140	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Amonium Phosphate (Monobasic) $NH_4 H_2 PO_4$	all	120	180	212	140	140	140	R to 248	140	---	---
Amonium Sulfate $(NH_4)_2 SO_4$	Sat'd.	120	180	212	140	140	140	R to 212	140	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
Amonium Sulfide $(NH_4)_2 S$	dilute	120	180	212	140	140	140	---	140	---	---
	Sat'd.	---	---	---	---	140	---	---	---	---	---
Amonium Thiocyanate $NH_4 SCN$	50-60%	120	180	212	140	140	140	R to 212	73	---	---
Amyl Acetate $CH_3 COOC_5 H_{11}$	--		N	N	N	N	73	--- 122	R to	73 194	C to ---
Amyl Alcohol $C_5 H_{11} OH$	--	---	N	---	N	140	140	R to 212	R to 140	---	---
	100%	---	---	---	---	---	C to 140	---	---	---	---
n-Amyl Chloride $CH_3 (CH_2)_3 CH_2 CL$	--	N	N	N	N	C to 73	---	---	C to 73	---	---
Anisole		---	---	---	---	---	---	---	---	---	C to 73
Aniline I_2	--	N	N	---	N	73	C to 140	R to 68	C to	--- 140	N
Aniline Chlorohydrate	--	---	N	---	N	C to 73	N	---	C to 73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Aniline Hydrochloride $C_6H_5NH_2oHCl$	sat'd	---	N	---	N	140	N	---	140	---	---
Anthraquinone $C_6H_5(CO)_2C_6H_5$	--	---	180	---	140	C to 73	C to 73	---	C to 73	---	---
Anthraquinone Sulfonic Acid $C_{14}H_7O_2oSO_3Ho_3H_2O$	--	---	180	73	140	140	C to 73	---	C to 73	---	---
Antifreeze		---	---	---	---	---	---	---	---		R to 73 C to 176
Antimony Trichloride $SbCl_3$	sat'd	---	180	140	140	140	140	R to 140	140	---	---
Aqua Regia (Nitrohydrochloric Acid)	--	N	R to	N 73	C to	N 73	N	C to	N 194	---	---
Arsenic Acid $H_3AsO_4o1/2H_2O$	80%	---	180	140	140	140	140	R to 248	140	---	---
Aryl Sulfonic Acid $C_6H_5SO_3H$	--	---	180	---	140	73	---	---	73	---	---
Asphalt	--	---	N	73	N	73	140	---	73	---	---
Barium Carbonate $BaCO_3$	sat'd	120	180	140	140	140	140	R to 248	140	---	---
Barium Chloride $BaCl_2o2H_2O$	sat'd	120	180	140	140	140	140	R to 212	140	194	---
Barium Hydroxide $Ba(OH)_2$	sat'd	73	180	140	140	140	140	---	R to 212	---	---
	10%	---	---	---	---	---	---	---	---	---	R to 73

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
Barium Nitrate $Ba(NO_3)_2$	sat'd	73	180	140	73	140	---	---	140	---	---
Barium Sulfate $BaSO_4$	sat'd	73	180	140	140	140	140	R to 212	140	---	---
Barium Sulfide BaS	sat'd	73	180	140	140	140	140	---	R to 248	---	---
Beer	--	120	180	180	140	R to 140	140	R to 248	R to 140	68	R to 73
Beet Sugar Liquors	--	---	180	180	140	73	140	---	73	---	---
Benzaldehyde C_6H_5CHO	10%	N	R to 73	73	R to 73	73	C to 73	---	73	R to 104	---
	99%	---	---	---	---	---	---	---	---	---	C to 73
Benzene C_6H_6	--	N	N	N	N	C to 120	N	C to 122	R to 68	---	---
Benzene Sulfonic Acid $C_6H_5SO_3H$	10%	---	180	180	140	R to 73	---	---	R to 73	---	---
	10%+	---	N	---	N	---	---	---	---	---	---
Benzoic Acid C_6H_5COOH	all	160	180	73	140	140	140	---	R to 248	---	---
Benzoyl Chloride	Sat. Sol.	---	---	---	---	---	---	C to 68	---	---	---
Benzyl Alcohol $C_6H_5CH_2OH$	--	---	N	120	N	140	---	R to 122	140	R to 68	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Benzyl Chloride		---	---	---	---	---	---	---	R to 140	---	---
Bismuth Carbonate $(BiO)_2 CO$	Sat'd.	---	180	180	140	140	140	---	140	---	---
Black Liquor	sat'd	---	180	140	140	120	140	---	120	---	---
Bleach	5% Active Cl_2	---	180	120	140	C to 140	---	---	C to 140	---	R to 73
	12% Active Cl_2	73	185	120	140	73	140	---	73	---	---
Borax $Na_3 B_4 O_7$ o$10H_2O$	sat'd	160	180	212	140	140	140	---	140	---	---
Boric Acid $H_3 BO_3$	Sat'd	160	180	212	140	140	140	R to 212	140	---	---
Brake Fluid	--	---	---	140	---	140	---	---	140	---	---
Brine	sat'd	---	180	140	140	140	140	---	140	---	---
Bromic Acid $HbrO_3$	Sat'd	---	180	N	140	N	140	R to 212	N	---	---
	10%	---	---	---	---	140	---	---	---	---	---
Bromine Br_2	Liquid	73	N	N	N	N	N	R to 248	N	N	---
	vapor 25%	---	180	N	140	N	---	---	N	---	---
Bromine Water	cold	---	180	N	140	N	C to	R to	N	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	sat'd						73	176			
Bromobenzene	--	---	---	---	N	---	---	---	---	---	---
$C_6 H_5 Br$											
Bromotoluene	--	---	---	C	N	---	---	---	---	---	---
$C_6 H_5 CH_2 B_2$											
Butadiene	50%	---	180	N	140	73	---	---	73	---	---
$H_2 C: CHHC: CH_2$	Gas	---	---	---	---	---	---	R to 212	---	---	---
Butane	50%	---	180	140	140	140	N	---	140	---	---
$C_4 H_{10}$	Gas	---	---	---	---	---	---	R to 68	---	---	---
n-Butanol	Liquid	---	---	---	---	---	---	R to 140	---	---	R to 73
Butyl Acetate	100%	N	N	C to 73	N	C to 73	C to 73	C to 104	C to 73	R to 194	---
$CH_3 COOCH (CH_3) (C_2 H_5)$											
Butyl Alcohol	--	---	C to 73	180	140	140	140	---	140	C to 104	---
$CH_3 (CH_2)_2 CH_2OH$											
Butyl Cellosolve	--	---	N	---	73	---	---	---	---	---	---
$HOCH_2 CH_2 OC_4 H_9$											
n-Butyl Chloride	--	N	N	---	---	---	---	---	---	---	---
$C_4 H_9 Cl$											
Butyl Glycol	Liquid	---	---	---	---	---	---	R to 212	---	---	---
Butylene ©	Liquid	---	---	N	140	120	---	---	120	---	---
$CH_3 CH:CHCH_3$											

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Butyl Phenol $C_4H_9C_6H_9OH$	--		---	N	C to 73	73	73	---	R to 176	---	---
Butyl Phthalate	--	---	N	180	---	---	---	R to 140	---	---	---
Butyl Stearate	--	---	---	---	73	---	---	---	---	---	---
Butynediol $HOCH_2C{:}CCH_2OH$	--	---	---	---	73	---	---	----	---	---	---
Butyric Acid $CH_3CH_2CH_2COOH$	--	N	N	180	73	73	73	---	73	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	Liquid	---	---	---	---	---	---	R to 176	73	---	---
Cadmium Cyanide $Cd(CN)_2$	--	---	180	---	140	---	---	---	---	---	---
Calcium Bisulfide $Ca(HS)_2 \cdot 6H_2O$	--	---	73	---	N	140	---	---	140	---	---
Calcium Bisulfite $Ca(HSO_3)_2$	--	---	180	180	140	N	140	---	N	---	---
	Sat'd	---	---	---	---	---	---	R to 248	---	---	---
Calcium Carbonate $CaCO_3$	Sat'd	---	180	180	140	140	140	R to 248	140	---	---
Calcium Chlorate $Ca(ClO_3)_2 \cdot 2H_2O$	--	---	180	180	140	140	140	R to 248	140	---	---
Calcium Chloride $CaCl_2$	5%	---	---	---	---	---	---	---	---	---	R to 176
	Sat'd	120	180	180	140	140	140	R to 248	R to 176	R to 194	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Calcium Hydroxide $Ca(OH)_2$	--	160	180	180	140	140	140	---	140	---	---
	2%	---	---	---	---	---	---	---	---	---	R to 73
	30%	---	---	---	---	R to 140	---	---	R to 140	---	---
Calcium Hypochlorite $Ca(OCl)_2$	30%	160	180	140	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	---	---	C to 212	---	---	---
Calcium Nitrate $Ca(NO_3)_2$	--	---	180	180	140	140	140	---	140	---	---
	50%	---	---	---	---	140	---	R to 212	140	---	---
	Sat'd	---	---	---	---	---	---	R to 176	---	---	---
Calciuim Oxide CaO	--	---	180	---	140	140	---	---	140	---	---
Calcium Sulfate $CaSO_4$	--	100	180	180	140	140	140	R to 212	140	---	---
Calcium Hydrogen Sulphide	>10%	---	---	---	---	---	---	R to 248	---	---	---
Camphor $C_{10}H_{16}O$	--	N	---	73	73	73	---	---	73	---	---
Cane Sugar Liquors $C_{12}H_{22}O_{11}$	--	---	180	180	140	140	150	---	140	---	---
Carbitol	--	---	N	---	73	---	---	---	---	---	---
Carbon Dioxide	Dry	160	180	140	140	140	---	R to	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
CO_2	100%							212			
Carbon Dioxide CO_2	Wet	160	180	140	140	140	140	---	140	---	---
Carbon Disulfide CS_2	--	N	N	N	N	C to 140	---	---	R to 68	R to 104	---
Carbon Monoxide CO	Gas	---	180	180	140	140	140	R to 140	140	---	---
Carbon Tetrachloride CCL_4	--	N	N	N	73	C to 73	N	C to 212	C to 68	N	R to 73
Carbonic Acid $H_2 CO_3$	Sat'd ---	185	180	140	140	140	---	---	140	---	---
Castor Oil	--	---	C to 180	140	140	73	140	---	73	---	---
Caustic Potash KOH	50%	160	180	180	140	140	73	---	140	---	---
Caustic Soda NaOH (Sodium Hydroxide)	40%	160	180	180	140	140	73	---	140	---	---
Cellosolve $ClCH_2 COOH$	--	---	N	73	73	C to 120	140	---	C to 120	---	---
Cellosolve Acetate $CH_3 COOCH_2 CH_2 OC_2 H_5$	--	---	N	73	73	---	---	---	---	---	---
Chloral Hydrate $CCL_3 CH (OH)_2$	All	---	180	C to 73	140	120	140	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Chloramine NH_2Cl	Dilute	---	N	73	73	73	---	---	73	---	---
Chloric Acid	10%	---	180	73	140	73	---	---	73	---	---
$HCLO_3$ o$7H_2O$	20%	---	185	73	140	73	---	---	73	---	---
Chlorine Gas (Moisture Content)	0-20 PPM	N	C to 73	N	C to 73	C to 73	---	R to 212	C to 73	---	---
	20-50 PPM	N	N	N	N	C to 73	---	---	C to 73	---	---
	50+ PPM	N	N	N	N	C to 73	---	N	C to 73	---	---
Chlorine	Liquid	N	N	N	N	N	---	---	N	---	N
Chlorinated Water	10 PPM	---	180	180	140	140	140	---	140	---	---
Chlorinated Water	Sat'd	---	180	180	140	C to 120	140	R to 212	C to 120	---	---
Chloroacetic Acid $CH_2ClCOOH$	50%	N	180	C to	140 73	120	N	---	120	---	---
	>10%	---	---	---	---	---	---	R to 140	---	---	---
Chloroacetyl Chloride $ClCH_2COCl$	--	---	---	---	73	---	---	---	---	---	---
Chlorobenzene C_6H_5Cl	Dry	N	N	73	N	C to 75	N	---	C to 75	---	---
	Liquid	---	---	---	---	---	---	R to 140	R to 68	C to 176	---
Chlorobenzyl Chloride $ClC_6H_4CH_2Cl$	--	---	N	---	N	C to 120	---	---	C to 120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK	
Chloroethanol	Liquid		---	---	---	---	---	N 122	R to	---	---	---
Chloroform $CHCl_3$	Dry	N	N	N	N	C to 75	C to 73	---	C to 75	---	---	
	Liquid	---	---	---	---	---	---	R to 212	N	---	C to 73	
Chloromethane	Gas	---	---	---	---	---	---	R to 212	---	---	---	
Chloropicrin CCL_3 NO_2	--	---	---	---	N	73	---	---	73	---	---	
Chlorosulfonic Acid $ClSO_2$ OH	--	---	73	N	73	C to 120	N	---	C to 120	---	---	
	50%	---	---	---	---	---	---	R to 68	---	---	---	
	100%	---	---	---	---	N	---	---	N	---	---	
Chromic Acid H_2 CrO_4	Sat'd	---	---	---	---	---	---	R to 212	---	---	---	
	10%	73	180	140	140	73	140	R to 212	73	N	---	
	20%	---	---	---	---	---	---	R to 212	---	---	---	
	25%	---	---	---	---	---	---	R to 212	---	---	---	
	30%	N	180	73	140	73	140	R to 212	73	---	---	
	40%	N	180	73	140	73	73	R to 212	73	---	---	
	50%	N	C to 140	73	N	73	N	R to 212	73	---	---	

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Chromium Potassium Sulfate	>10%	---	---	---	---	---	---	R to 212	---	---	---
$CrK(SO_4)_2$ o12H_2 O	--	-	--	73	---	73	---	---	73	---	---
	Sat'd	---	---	---	---	---	R to 212	---	---	---	---
Citric Acid $C_6 H_8 O_7$	Sat'd	160	180	140	140	140	140	R to 248	140	C to 140	---
Coconut Oil	--	---	C to 180	73	140	73	140	R to 248	73	---	---
Cod Liver Oil	Work Sol.	---	---	---	---	---	---	R to 248	---	---	---
Coffee	--	---	180	140	140	140	---	---	140	---	---
Coke Oven Gas	--	---	---	73	140	140	---	---	140	---	---
Copper Acetate $Cu(C_2 H_3 O_2)_2$ oH_2 O	Sat'd	---	73	73	73	---	---	---	---	---	---
Copper Carbonate $CuCO_3$	Sat'd	---	180	---	140	140	---	---	140	---	---
Copper Chloride $CuCl_2$	Sat'd	73	180	140	140	140	140	---	140	---	---
Copper Cyanide $Cu(CN)_2$	Sat'd	---	180	---	140	140	140	R to 212	140	---	---
Copper Fluoride CuF_2 o2H_2 O	2%	---	180	73	140	140	140	---	140	---	---
Copper Nitrate	30%	---	180	140	140	140	140	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
$Cu(NO_3)_2 \cdot 3H_2O$	50%	---	---	---	---	---	---	R to 212	---	---	---
Copper Sulfate $CuSO_4 \cdot 5H_2O$	Sat'd	120	180	120	140	140	140	R to 212	140	R to 194	---
Corn Oil	--	---	C to 180	73	140	120	---	---	120	---	---
Corn Syrup	--	---	185	140	140	140	---	---	140	---	---
Cottonseed Oil	--	120	C to 180	140	140	R to 140	140	---	R to 140	---	---
Creosote	--	---	N	73	N	140	---	---	140	---	---
Cresol $CH_3C_6H_4OH$	90%	N	N	R to 73	N	73	N	R to 68	73	---	---
Cresylic Acid	50%	---	180	---	140	C to 73	N	---	C to 73	---	---
Croton Aldehyde $CH_3CH{:}CHCHO$	--	---	N	C to 73	N	---	---	---	---	---	---
	Liquid	---	---	---	---	---	---	R to 104	--	---	---
Crude Oil	--	---	C to 180	140	140	C to 120	C to 73	R to 212	C to 120	R to 140	---
Cupric Chloride	20%	---	---	---	---	---	---	---	---	---	R to 73
Cupric Fluoride CuF_2	--	---	180	---	140	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK	
Cupric Sulfate $CuSO_4 o5H_2 O$	Sat'd	100	180	73	140	140	---	---	---	---	---	
Cuprous Chloride $CuCl$	Sat'd	70	180	---	140	140	---	---	140	---	---	
Cyclohexane $C_6 H_{12}$	--	73	N	N	N	N	---	R to 248	N	C to 140	---	
Cyclohexanol $C_6 H_{11} OH$	--	C to 120	N	140	N	73	C to 73	R to 104	73	---	---	
Cyclohexanone $C_6 H_{10} O$	-- Liquid	N	N	73	N	120	N	N	C to 176	C to 140	---	
Detergents (Heavy Duty)	--	---	C to 180	180	140	R to 140	---	---	R to 140	---	R to 73	
Dextrin (Starch Gum)	Sat'd	---	180	140	140	140	140	---	140	---	---	
Dextrose	Sat'd	---	180	140	140	140	140	---	140	---	---	
Diacetone Alcohol $CH_3 COCH_2 C(CH_3)_2 OH$	--	---	N	120	N	---	---	---	---	C to 140	---	
Dibutoxyethyl Pthalate $C_6 H_4 (COOO_2 H_2 OC_4 H_9)_2$	--		---	N	---	N	---	---	---	---	---	---
n-Dibutyl Ether $C_4 H_9 OC_4 H_9$	--	---	---	---	---	73	---	---	73	---	---	
Dibutyl Phthalate $C_6 H_4 (COOC_4 H_9)_2$	--	N	N	73	N	73	---	---	73	---	---	

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Dibutyl Sebacate $C_4H_9OCO(CH_2)_8OCOC_4H_9$	--	---	---	73	73	73	---	---	73	---	---
Dichloroacetic Acid	50%	---	---	---	---	---	---	R to 176	---	---	---
Dichlorobenzene $C_6H_4Cl_2$	--	N	N	C to 73	N	C to 120	---	---	C to 120	---	R to 73
	Liquid	---	---	---	---	---	---	R to 140	---	---	---
Dichloroethylene $C_2H_2Cl_2$	--	---	N	C to 73	N	C to 120	---	---	C to 120	---	---
	Liquid	---	---	---	---	---	---	R to 248	---	---	---
Diesel Fuels	--	---	C to 180	140	140	73	C to 73	R to 212	73	---	---
Diethanolamine	Solid	---	---	---	---	---	---	N	---	---	---
	20%	---	---	---	---	---	---	---	R to 194	---	---
Diethylamine $C_4H_{10}NH$	--	N	N	---	N	C to 120	N	N	C to 120	---	---
Diethyl Ether $C_4H_{10}O$	--	N	N	73	73	C to 140	---	---	C to 140	140	---
Diglycolic Acid	Sat'd	---	180	140	140	140	140	---	140	---	---
$O(CH_2COOH)_2$	10%	---	---	---	---	---	---	R to 140	---	---	---
Dimethylamine $(CH_3)_2NH$	--	---	---	73	140	73	N	N	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Dimethyl Formamide	--	N	N	180	N	120	---	---	120	---	C to 73
$HCOH(CH_3)_2$	Liquid		---	---	---	---	---	---	N	---	---
Dimethylhydrazine $(CH_3)_2 NNH_2$	--	---	---	---	N	---	---	---	---	---	---
Dimethyl Phthalate $OOC_9 H_{19}$)	--	---	N	---	--- 73	C to	---	---	C to 73	---	---
Dioctyl Phthalate $C_6 H_4 (COOC_8 H_{17})_2$	--	N	N	C to 73	N	73	C to 73	---	73	140	---
Dioxane $O{:}(CH_2)_4{:}O$	--	--	N	C to 140	N	140	---	---	140	---	---
	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Diphenyl Oxide $(C_6 H_5)_2 O$	Sat'd	---	---	---	---	73	---	---	73	---	---
Disodium Phosphate $Na_2 HPO_4$	--	---	180	140	140	140	140	---	140	---	---
Dishwashing Liquid (Cascade)		---	---	---	---	---	---	---	---	---	R to 73
Dow Therm A	--	---	---	---	N	---	---	---	---	---	---
Ethanol	40%	---	---	---	---	---	---	R to 68	---	---	---
	95%	---	---	---	---	---	---	R to 122	R to 140	---	---
	Liquid	---	---	---	---	---	---	R to 122	R to 140	---	R to 176
Ether	--	N	N	C to	N	73	N	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
ROR				73							
Ethyl Acetate $CH_3 COOC_2 H_5$	--	N	N	C to 140	N	73	C to 73	---	73	140	R to 73 C to 176
	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Ethyl Acetoacetate $CH_3 COCH_2 COOC_2 H_5$	--	N	N	---	N	---	---	---	---	---	---
Ethyl Acrylate $CH_2 :CHOOC_2 H_5$	--	---	N	---	N	---	---	---	---	---	---
Ethyl Alcohol (Ethanol) $C_2 H_5 OH$	--	---	C to 140	140	140	140	140	---	140	C to 104	R to 176
Ethyl Benzene $C_6 H_5 C_2 H_5$	--	---	---	C to 73	N	C to 73	---	---	---	---	---
Ethyl Chloride $C_2 H_5 Cl$	Dry	---	N	C to 73	N	C to 73	---	---	C to 73	---	---
	Gas	---	---	---	---	---	---	R to 212	---	---	---
Ethyl Chloroacetate $CCH_2 ClCO_2 C_2 H_5$	--	---	---	---	N	---	---	---	---	---	---
Ethyl Ether $(C_2 H_5)_2 O$	Liquid	---	N	N	N	N	N	R to 122	R to 68	---	---
Ethylene Bromide $BrCH_2 CH_2 Br$	Dry	---	N	---	N	---	N	---	---	---	---
Ethylene Chloride	Dry	N	N	C to	N	C to	---	---	C to	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
$ClCH_2\ CH_2\ CL$				73		140			140		
Ethylene Chlorohydrin	--	---	N	73	N	---	N	---	---	---	---
$ClCH_2\ CH_2\ OH$	Liquid	---	---	---	---	---	---	C to 68	---	---	---
Ethylene Diamine $NH_2\ CH_2\ CH_2\ NH_2$	--	N	---	73	N	140	---	---	140	---	---
Ethylene Dichloride $C_2\ H_4\ Cl_2$	Dry	N	N	C to 140	N	C to 73	140	---	C to 73	---	---
Ethylene Glycol $CH_2\ OHCH_2\ OH$	Liquid	73	C to 180	212	140	140	140	R to 212	R to 212	---	C to 176
Ethylene Oxide $CH_2\ CH_2\ O$	--	---	N	C to 73	N	73	---	---	73	C to 140	---
2-Ethylhexanol $CH_3\ (CH_2\ )_3\ CHC_2\ H_5\ CH_2\ OH$	--	---	---	---	---	73	---	---	73	---	---
Fatty Acids R-COOH	--	160	73	120	140	120	150	---	120	194	---
Ferric Chloride (Aqueous) $FeCl_3$	Sat'd	120	180	140	140	140	150	R to 212	140	---	---
Ferric Hydroxide $Fe(OH)_3$	Sat'd	160	180	140	140	140	---	---	140	---	---
Ferric Nitrate $Fe(NO_3\ )_3\ 9H_2\ O$	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Ferric Sulfate	--	160	180	140	140	140	140	---	140	---	---
$Fe_2\ (SO_4\ )_3$	Sat'd	---	---	---	---	---	---	R to	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
								212			
Ferrous Chloride $FeCl_2$	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Ferrous Hydroxide $Fe(OH)_2$	Sat'd	160	180	140	140	140	---	---	140	---	---
Ferrous Nitrate $Fe(NO_3)_2$	--	160	180	140	140	140	---	---	140	---	---
Ferrous Hydroxide $Fe(OH)_2$	Sat'd	160	180	140	140	140	---	---	140	---	---
Ferrous Nitrate $Fe(NO_3)_2$	--	160	180	140	140	140	---	---	140	---	---
Ferrous Sulfate $FeSO_4$	--	160	180	140	140	140	140	---	140	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Ferrous Chloride $FeCl_2$	Sat'd	160	180	140	140	140	140	R to 212	140	---	---
Fish Oil	---	---	180	180	140	140	140	---	140	---	---
Fluoboric Acid	---	73	73	140	140	140	---	---	140	---	---
HBF_4	Solid	---	---	---	---	---	---	R to 104	---	---	---
Fluorine Gas (Dry) F_2	100%	---	73	N	73	C to 73	C to 73	---	C to 73	N	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Fluorine Gas (Wet) F_2	--	N	73	N	73	N	N	---	N	N	---
Fluosilicic Acid H_2SiF_6	25%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	R to 140	140	140	140	---	R to 212	---	---	---
	40%	---	---	---	---	---	---	R to 140	---	---	---
	50%	---	73	73	140	140	140	R to 212	--	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Formaldehyde HCHO	Dilute	160	73	140	140	140	140	R to 176	---	C to 104	---
	35%	160	C to 73	140	140	140	140	---	140	---	---
	37%	160	C to 73	140	140	140	140	R to 212	140	---	---
	50%	---	C to 73	---	140	140	140	---	140	---	---
Formic Acid HCOOH	--	N	C to 73	140	73	140	150	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	R to 140	N	N
	40%	---	---	---	---	---	---	R to 212	R to 140	---	---
	50%	---	---	---	---	---	---	R to 176	R to 140	---	---
	85%	---	---	---	---	---	---	R to 212	---	---	---
	100%	---	---	---	---	140	---	---	140	---	---
Freon 11 CCl_3F	100%	N	73	N	140	73	---	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Freon 12	100%	---	73	73	140	73	---	---	73	68	---
CCl_2F_2	Work. Sol.	---	---	---	---	---	---	R to 212	R to 68	---	---
Freon 21 $CHCl_2F$	100%	---	---	N	N	C to 120	---	---	C to 120	---	---
Freon 22 $CHClF_2$	100%	---	73	73	N	C to 120	---	---	C to 120	68	---
Freon 113 $C_2Cl_2F_3$	100%	---	---	N	140	73	---	---	73	---	---
Freon 114 $C_2Cl_2F_4$	100%	---	---	N	140	73	---	---	73	---	---
Fructose $C_6 H_{12} O_6$	Sat'd	73	180	180	140	140	140	---	140	---	---
Fruit Juice	Work. Sol.	---	---	---	---	---	---	R to 212	---	104	---
Furfural $C_4 H_3 OCHO$	100%	N	N	N	N	C to 140	---	---	C to 140	C to 140	---
Gallic Acid $C_6 H_2 (OH)_3 CO_2 HoH_2 O$	--	---	73	---	140	73	---	---	73	---	---
Gasoline, Leaded*	--	N	N	N	140	73	N	---	73	---	---
Gasoline, Unleaded*	--	N	N	N	140	73	N	---	73	---	R to 176
Gasoline (Fuel)		---	---	---	---	---	---	R to 212	---	R to 160	---
Gasohol*	--	N	N	N	140	73	N	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Gasoline, Sour*	--	N	N	N	140	C to 73	N	---	C to 73	---	---
Gelatin	--	---	180	180	140	140	140	---	140	---	---
Glucose	--	120	180	212	140	140	140	---	140	---	---
$C_6H_{12}O_6 oH_2O$	10%	---	---	---	---	---	---	R to 248	---	---	---
Glue	--	---	---	140	140	140	---	---	140	---	---
Glycerine	--	140	180	212	140	140	140	---	140	---	---
$C_3H_5(OH)_3$	Liquid	---	---	---	---	---	---	R to 248	---	---	---
Glycol $OHCH_2CH_2OH$	--	---	C to 180	212	140	140	---	---	140	C to 140	---
Glycolic Acid	Sat'd	---	180	73	140	140	---	---	140	---	---
$OHCH_2COOH$	10%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	---	---	---	---	---	R to 140	---	---	---
	65%	---	---	---	---	---	---	R to 212	---	---	---
Glyoxal CHCCHO	--	---	---	---	---	140	---	---	140	---	---
Grape Sugar	--	---	180	---	140	---	---	---	---	---	---
Grapefruit Juice	Work. Sol.	---	---	---	---	---	---	R to 122	---	---	---
Grease	--	---	---	---	---	---	---	---	---	194	---
Green Liquor	--	160	180	---	140	---	140	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Heptane (Type 1)	--	73	180	N	140	73	N	---	73	---	---
$C_7 H_{16}$	Liquid	---	---	---	---	---	---	R to 212	C to 176	---	---
n-Hexane	--	C	73	73	73	---	---	---	---	---	---
$C_6 H_{14}$	Liquid	---	---	---	---	---	---	R to 176	---	---	R to 73
Hexanol, Tertiary Type I $CH_3 (CH_2)_4 CH_2 OH$	--	---	180	---	140	140	140	---	140	---	---
Hydraulic Oil (Petroleum)	--	---	---	---	73	73	---	---	73	---	---
Hydrazine $H_2 NNH_2$	--	---	N	73	N	---	---	---	---	---	---
Hydrobromic Acid Hbr	20%	73	73	140	140	140	140	R to 212	140	---	---
	50%	N	---	120	---	140	---	R to 140	140	---	---
	66%	---	---	---	---	---	---	R to 212	---	---	---
Hydrochloric Acid Hcl	1%	---	---	---	---	---	---	---	---	---	R to 176
	10%	C to 120	180	140	140	140	140	R to 212	R to 212	C to 104	N
	20%	---	---	---	---	---	---	R to 212	R to 212	---	---
	30%	C to 73	180	140	140	140	140	R to 212	R to 140	---	---
	Conc.	---	---	---	---	---	---	---	R to 140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Hydrocyanic Acid	--	160	180	73	140	140	140	---	140	---	---
HCN	Sat'd	---	---	---	---	---	---	R to 248	---	---	---
	10%	---	---	---	---	---	---	R to 248	---	---	---
Hydrofluoric Acid HF	Dilute	73	73	180	73	140	140	R to 212	140	---	---
	30%	N	73	140	73	140	140	---	140	---	---
	40%	---	---	---	---	---	---	R to 212	---	---	---
	50%	N	N	73	73	120	140	R to 212	120	---	---
	60%	---	---	---	---	140	---	R to 140	140	---	---
	70%	---	---	---	---	---	---	R to 212	---	---	---
	100%	N	N	C to 73	N	120	---	---	120	---	---
	Gas	---	---	---	---	---	---	R to 104	---	---	---
Hydrofluosilic Acid	50%	N	140	---	140	140	---	---	140	---	---
Hydrogen	Gas	---	73	140	140	140	140	R to 248	140	194	---
Hydrogen Cyanide HCN	--	---	---	73	140	---	---	---	---	---	---
Hydrogen Fluoride Anhydrous	--	---	C	73	N	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (°F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Hydrogen Peroxide H_2O_2	3%	---	---	---	---	---	---	---	---	---	R to 73
	10%	---	---	---	---	---	---	R to 212	---	---	---
	30%	---	---	---	---	---	---	R to 212	---	C to 104	---
	50%	---	180	73	140	140	N	R to	140	---	---
	90%	---	180	C to 73	140	73	N	---	73	---	---
Hydrogen Phosphide (Type I) PH3	--	---	73	---	140	140	140	---	140	---	---
Hydrogen Sulfide H_2S	Dry	---	180	150	140	140	140	R to 248	140	---	---
	Wet	---	180	---	140	140	---	---	140	---	---
Hydrogen Sulfite H_2SO_3	10%	---	---	---	---	140	---	R to 248	140	---	---
Hydroquinone $C_6H_4(OH)_2$	Sat'd	---	180	---	140	140	140	---	---	140	---
Hydroxylamine Sulfate $(NH_2OH)oH_2SO_4$	--	---	180	---	140	140	---	---	140	---	---
Hypochlorous Acid HOCl	10%	73	180	73	140	140	140	---	140	---	---
	70%	---	---	---	---	---	---	R to 212	---	---	---
Inks	--	---	---	140	---	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Iodine I_2	10%	N	73	73	N	C to 120	N	R to 176	C to 120	---	---
Isobutyl Alcohol $(CH_3)_2CHCH_2OH$	--	C to 73	C to 73	73	---	140	---	---	140	---	---
Isooctane $(CH_3)_3CCH_2CH(CH_3)2$	--	---	---	C to 73	---	73	---	---	73	---	---
	Liquid	---	---	---	---	---	---	R to 212	---	---	---
Isopropyl Acetate $CH_3COOCH(CH_3)_2$	--	N	N	---	---	73	---	---	73	---	---
Isopropyl Alcohol $(CH_3)_2CHOH$	--	---	C to 180	212	140	140	140	C to 212	140	---	R to 73
Isopropyl Ether $(CH_3)_2CHOCH(CH_3)_2$	--	---	N	C to	N 73	73	---	---	73	---	---
JP-4 Fuel*	--	---	C to 73	C to 73	140	73	---	---	73	---	---
JP-5 Fuel*	--	---	C to 73	C to 73	140	73	---	---	73	---	---
Kerosene*	--	73	73	C to 140	140	C to 140	C to 73	---	C to 140	---	---
Ketchup	--	---	---	---	73	---	---	---	---	---	---
Ketones	--	N	N	C to 73	N	73	---	---	73	---	---
	Work Sol		---	---	---	---	---	--- 302	R to	---	---
Kraft Liquors	--	73	180	---	140	120	140	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lactic Acid $CH_3CHOHCOOH$	10%	---	---	---	---	---	---	R to 140	---	---	---
	20%	---	---	---	---	---	---	---	---	---	R to 73
	25%	73	180	212	140	140	140	---	140	---	---
	80%	N	C to 180	140	73	140	---	---	140	---	---
	Liquid	---	---	---	---	---	---	R to 212	---	R to 194	---
Lard Oil	--	---	C to 180	---	140	C to 120	73	---	C to 120	---	---
Latex	--	---	---	140	---	140	---	---	140	---	---
Lauric Acid $CH_3(CH_2)_{10}COOH$	--	---	180	140	140	120	---	---	120	---	---
Lauryl Chloride (Type I) $C_{12}H_{25}Cl$	--	---	73	---	140	120	73	R to 248	120	---	---
Lead Acetate $Pb(C_2H_3O_2)o3H_2O$	Sat'd	---	180	180	140	140	140	R to 212	140	---	---
Lead Chloride $PBCl_2$	--	---	180	140	140	120	---	---	120	---	---
Lead Nitrate $PB(NO_3)_2$	Sat'd	---	180	140	140	120	---	---	120	---	---
Lead Sulfate $PbSO_4$	--	---	180	140	140	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lead Tetraethyl		---	---	---	---	---	---	R to 212	---	---	---
Lemon Oil	--	---	N	C to 73	---	---	---	---	---	---	---
Lemon Juice		---	---	---	---	C to 140	---	---	C to 140	---	---
Ligroin	--	---	---	140	---	---	---	---	---	---	---
Lime Slurry	--	---	---	---	---	140	---	---	140	---	---
Lime Sulfur	--	---	73	73	73	120	140	---	120	---	---
Linoleic Acid $CH_3(CH_2)_4HC{:}CHCH_2CH{:}CH(CH_2)_7COOH$	--	---	180	180	140	---	73	---	---	---	---
Linoleic Oil (Type I)	--	---	---	---	140	---	73	---	---	---	---
Linseed Oil	--	73	C to 180	140	140	R to 73	73	R to 248	R to 73	194	---
Liqueurs	--	---	---	140	140	120	140	---	120	---	---
Lithium Bromide LiBr	--	---	---	140	140	140	---	---	140	---	---
Lithium Chloride LiCl	--	---	---	140	140	120	---	---	120	---	---
Lithium Hydroxide LiOH	--	---	---	140	---	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Lubricating Oil (ASTM #1)	--	---	180	C to 140	140	73	140	R to 248	73	---	---
Lubricating Oil (ASTM #2)	--	---	180	C to 140	140	73	140	---	73	---	---
Lubricating Oil (ASTM #3)	--	---	180	C to 140	140	73	140	---	73	---	---
Magnesium Carbonate $MgCO_2$	--	120	180	212	140	140	140	R to 212	140	---	---
Magnesium Chloride MgCl2	Sat'd	120	180	140	140	140	140	R to 140	140	---	---
	50%	---	---	---	---	---	---	R to 212	----	194	---
Magnesium Citrate $MgHC_6H_5O_7 \cdot 5H_2O$	--	---	180	---	140	140	---	---	140	---	---
Magnesium Hydroxide $Mg(OH)_2$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Magnesium Nitrate $Mg(NO_3)_2 \cdot 2H_2O$	--	160	180	212	140	140	140	R to 248	140	---	---
Magnesium Oxide MgO	--	160	---	---	---	---	---	---	---	---	---
Magnesium Sulfate $MgSO_4 \cdot 7H_2O$	--	160	180	212	140	140	140	R to 212	140	---	---
Maleic Acid HOOCCH:CHCOOH	Sat'd	160	180	140	140	140	140	R to 140	140	---	---
	50%	---	---	---	---	---	---	R to	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	10%	---	---	---	---	---	---	212 R to 140	---	---	---
Malic Acid $COOHCH_2 CH(OH)COOH$	--	---	180	140	140	140	140	---	140	---	---
Manganese Sulfate $MnSO_4 o4H_2 O$	--	---	180	180	140	140	---	---	140	---	---
Margarine	Work. Sol.	---	---	---	---	---	---	R to 248	---	---	---
Mercuric Chloride	--	---	180	180	140	140	140	---	140	---	---
$HgCl_2$	Sat'd	--	---	---	---	---	---	R to 212	---	---	---
Mercuric Cyanide $Hg(CN)_2$	Sat'd	---	180	140	140	140	140	R to 212	140	---	---
Mercuric Sulfate $HgSO_4$	Sat'd	---	180	140	140	140	---	---	140	---	---
Mercurous Nitrate $HgNO_3 o2H_2 O$	Sat'd	---	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
Mercury Hg	Liquid	---	180	140	140	140	140	R to 248	140	194	---
Methane CH_4	--	N	73	73	140	140	---	---	140	140	---
Methanol (Methyl Alcohol)	--	---	N	180	140	R to 140	140	---	R to 140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
CH_3 OH	5%	---	---	---	---	---	---	R to 140	---	---	---
	Liquid	---	---	---	---	---	---	C to 176	R to 140	---	R to 176
Methoxyethyl Oleate CH_3 OCH_2 CH_2 $OOCC_{17}$ H_{33}	--	---	---	---	73	---	---	---	---	---	---
Methyl Acetate CH_3 CO_2 CH_3	--	N	N	140	N	C to	--- 120	---	C to	--- 120	---
Methyl Acrylate CH_2 :$CHOOCH_3$	Tech Pure	---	---	---	---	140	---	---	140	---	---
Methyl Amine CH_2 NH_3	--	---	N	N	N	---	---	---	---	---	---
Methyl Bromide CH_3 Br	--	---	N	N	N	C to 73	---	---	C to 73	R to 68	---
Methyl Butyl Ketone	Liquid	---	---	---	---	---	---	C to 122	---	---	---
Methyl Cellosolve $HOCH_2$ CH_2 OCH_3	--	---	N	73	N	C to 120	---	---	C to 120	---	---
Methyl Chloride CH_3 Cl	Dry	N	N	N	N	C to 120	N	---	C to 120	R to 68	---
Methyl Chloroform CH_3 Ccl	--	N	N	C to 73	N	C to 120	---	---	C to 120	---	---
Methyl Ethyl Ketone (MEK) CH_3 COC_2 H_5	100%	N	N	73	N	N	73	C to 68	R to 140	C to 140	R to 73 C to 176

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Methyl Isobutyl Carbinol $(CH_3)_2CHCH_2CH(CH_3)OH$	--	---	N	---	N	---	---	---	---	---	---
Methyl Isobutyl Ketone $(CH_3)_2CHCH_2COCH_3$	--	N	N	73	N	73	---	---	73	---	---
Methyl Isopropyl Ketone $CH_3COCH(CH_3)_2$	--	---	N	---	N	73	---	---	73	---	---
Methyl Methacrylate $CH_2{:}C(CH_3)COOH_3$	--	---	N	---	73	140	---	R to 68	140	---	---
Methyl Sulfate $(CH_3)_2SO_4$	---	---	73	C to 73	73	140	---	---	---	68	---
Methylene Bromide CH_2Br_2	--	---	N	N	N	C to 120	---	---	C to 120	---	---
Methylene Chloride CH_2Cl_2	100%	---	N	N	N	N	73	C to 104	N	---	C to 176
Methylene Chloro-bromide CH_2ClBr	--	---	N	--	N	---	---	---	---	---	---
Methylene Iodide CH_2I_2	--	---	N	N	N	C to 120	---	---	C to 120	---	---
Methysulfuric Acid CH_3HSO_4	--	---	180	140	140	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Milk	--	160	180	212	140	140	140	R to 212	140	194	---
Mineral Oil	--	73	180	C to 140	140	R to 73	C to 73	R to 212	C to 176	---	---
Molasses	--	---	180	140	140	140	140	---	140	---	---
Monochloroacetic Acid $CH_7 ClCOOH$	50%	---	---	140	140	140	---	---	140	---	---
Monochlorobenzene $C_6 H_5 Cl$	Tech Pure	---	N	73	N	C to 120	---	---	C to 120	---	---
Monoethanolamine $HOCH_2 CH_2 NH_2$	--	---	---	---	N	---	---	---	---	---	---
Motor Oil	--	---	180	C to 140	140	R to 140	---	---	R to 140	---	---
Morpholine $C_4 H_8 ONH$	--	---	---	140	---	140	---	---	140	---	---
Mustard, Aqueous	Work. Sol.	---	---	---	---	---	---	R to 248	---	---	---
N-methyl Pyrrolidone	100%	---	---	---	---	---	---	---	---	---	C to 73
Naphtha	--	---	73	73	140	73	73	R to 122	C to 176	R to 140	---
Naphthalene $C_{10} H_8$	--	---	N	73	N	73	73	---	73	R to 194	---
Natural Gas	--	73	---	73	140	140	73	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Nickel Acetate $Ni(OOCH_3)_2 \circ 4H_2O$	--	---	---	73	---	140	---	---	140	---	---
Nickel Chloride $NiCl_2$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Nickel Nitrate $Ni(NO_3)_2 \circ 6H_2O$	Sat'd	160	180	180	140	140	140	R to 248	140	---	---
Nickel Sulfate $NiSO_4$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Nicotine $C_{10}H_{14}N_2$	--	---	180	---	140	140	140	---	140	---	---
Nicotinic Acid Csh_4NCOOH	--	---	180	---	140	140	140	R to 212	140	---	---
Nitric Acid HNO_3	5%	---	---	---	---	---	---	R to 176	C to 140	N	---
	10%	C to 73	180	180	140	73	C to 73	R to 212	C to 140	---	---
	20%	---	---	---	---	---	---	R to 212	C to 140	---	---
	25%	---	---	---	---	---	---	R to 212	C to 140	---	---
	30%	N	R to 130	140	140	73	N	R to 212	C to 140	---	---
	35%	---	---	---	---	---	---	---	C to 140	---	---
	40%	N	R to 120	73	140	73	N	C to 248	140	---	---
	50%	N	110	N	100	C to 73	N	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	65%	---	---	---	---	---	---	C to 248	---	---	---
	70%	N	100	N	73	C to 73	N	---	C to 73	---	---
	85%	---	---	---	---	---	---	N	---	---	---
	95%	---	---	---	---	---	N	---	---	---	---
	100%	N	N	N	N	N	N	---	N	---	---
Nitrobenzene $C_6H_5NO_2$	100%	N	N	C to 140	N	N	---	R to 122	N	---	---
Nitroglycerine $CH_2NO_3CHNO_3CH_2NO_3$	--	---	---	---	N	73	---	---	73	---	---
Nitroglycol	--	---	---	---	N	---	---	---	---	---	---
Nitrous Acid HNO_2	10%	---	180	C to 73	140	73	---	---	73	---	---
Nitrous Oxide N_2O	--	---	73	73	73	73	---	---	73	---	---
n-Octane CH_8H_{18}	--	---	C to 73	---	---	---	---	---	---	---	---
Oleic Acid $CH_3(CH_2)_7CH:CH(CH_2)_7COOH$	--	160	180	73	140	C to 140	150	R to 248	C to 140	R to 140	---
Oleum $x H_2SO_4 oySO_3$	--	N	N	N	N	N	N	N	N	---	---
Olive Oil	--	160	C to 180	73	140	140	---	R to 248	R to 68	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Oxalic Acid $HOOCCOOHo2H_2O$	50%	160	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 140	---	R to 140	---
	Sat'd	---	---	---	---	---	---	R to 122	---	---	---
Oxygen Gas O_2	--	160	180	N	140	140	---	R to 212	140	R to 140	---
Ozone O_3	--	---	180	C to 73	140	C to 120	---	---	C to 120	C to 68	---
	Sat'd	---	---	---	---	---	---	R to 68	---	---	---
Palm Oil	--	---	---	73	---	140	---	---	140	---	---
Palmitic Acid $CH_3 (CH_2)_{14} COOH$	10%	73	73	180	140	120	150	---	120	---	---
	70%	---	73	180	73	120	---	---	120	---	---
Paraffin $C_{36} H_{74}$	--	73	180	140	140	C to 140	---	R to 212	C to 140	---	---
Peanut Oil	--	---	C to 180	140	---	---	---	R to 248	---	---	---
n-Pentane $CH_3 (CH_2)_3 CH_3$	--	N	C to 180	N	C to 140	C to 120	---	---	C to 120	---	--
Peracetic Acid $CH_3 COOOH$	40%	N	---	73	73	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Perchloric Acid (Type I)	10%	---	---	---	---	---	---	R to 212	---	---	---
$HclO_4$	20%	---	---	---	---	---	---	R to 212	---	---	---
Perchloric Acid (Type I) $HclO_4$	15%	---	180	140	73	140	C to 73	---	140	---	---
Perchloric Acid (Type I) $HclO_4$	70%	73	180	C to 73	73	73	N	R to 212	73	---	---
Perchloroethylene Cl_2 C:CCl_2	--	N	C to 180	C to 73	C to 140	C to 120	---	C to 212	C to 120	C to 68	---
Perphosphate	--	---	73	140	73	---	---	---	---	---	---
Petroleum Ether		---	---	---	---	---	---	R to 212	---	---	---
Phenol	--	N	73	73	73	140	73	---	140	N	---
C_6H_5OH	5%	---	---	---	---	---	---	---	R to 248	---	---
	50%	---	---	---	---	---	---	R to 176	---	---	---
	Solid	---	---	---	---	---	---	C to 122	---	---	---
	90%	---	---	---	---	R to 140	---	---	R to 140	---	---
Phenylhydrazine $C_6H_5NHNH_2$	--	---	N	N	N	C to	--- 120	R to	C to 104	--- 120	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Phenylhydrazine Hlydrochloride	10%	---	---	---	---	---	---	R to 140	---	---	---
Phosphine	Gas	---	---	---	---	---	---	R to 104	---	---	---
Phosphoric Acid H_3PO_4	10%	---	180	212	140	140	140	---	140	---	---
	50%	73	180	212	140	140	73	R to 212	140	C to 104	---
	75%	---	---	---	---	---	---	R to 212	---	---	---
	85%	---	180	212	140	73	---	C to 284	73	---	---
	98%	---	---	---	---	---	---	R to 212	---	---	---
Phosphoric Anhydride P_2O_5	--	---	73	73	73	---	---	---	---	---	---
Phosphorous (Red)	--	---	---	---	73	140	---	---	140	---	---
Phosphorous (Yellow)	--	--	---	---	73	140	---	---	140	---	---
Phosphorous Oxychloride	Liquid	---	---	---	---	---	---	R to 68	---	---	---
Phosphorous Pentoxide P_2O_5	--	---	73	73	73	140	---	---	140	---	---
Phosphorous Trichloride Pcl_3	--	--	N	73	N	120	C to 73	C to 122	120	---	---
Photographic Solutions	--	---	180	140	140	140	140	---	140	---	---
Phtalic Acid	--	---	---	140	C to	140	---	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
$C_6H_4(COOH)_2$					140						
	Susp.	---	---	---	---	---	---	R to 212	---	---	---
Picric Acid $C_6H_2(NO_2)_3OH$	10%	N	N	73	N	73	73	R to 212	73	C to 68	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd.	---	---	---	---	---	---	R to 212	---	---	---
Pine Oil	--	---	N	140	---	R to 73	---	---	R to 73	---	---
Plating Solutions (Brass)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Cadmium)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Chrome)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Copper)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Gold)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Lead)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Nickel)	--	---	180	140	140	140	C to 73	---	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Plating Solutions (Rhodium)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Silver)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Tin)	--	---	180	140	140	140	C to 73	---	140	---	---
Plating Solutions (Zinc)	--	---	180	140	140	140	C to 73	---	140	---	---
Potash (Aq) KOH	Sat'd	---	180	---	140	140	---	---	140	---	---
Potassium Alum $ALK(SO_4)_2 \cdot 12H_2O$	--	---	180	---	140	140	---	---	140	---	---
Potassium Aluminum Sulphate	--	---	180	180	140	---	C to 73	---	---	---	---
Potassium Amyl Xanthate	--	---	---	---	73	---	---	---	---	---	---
Potassium Bicarbonate $KHCO_3$	Sat'd	---	180	140	140	140	140	R to 212	140	---	---
Potassium Bichromate $K_2Cr_2O_7$	Sat'd	---	180	140	140	---	C to 73	R to 212	---	---	---
	40%	---	---	---	---	---	---	R to 212	---	---	---
Potassium Bisulfate $KHSO_4$	--	---	180	212	140	140	---	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Potassium Borate $K_2 B_4 O_7 o5H_2 O$	--	--	180	140	140	140	140	R to 212	140	---	---
Potassium Bromate $KbrO_3$	--	---	180	212	140	140	140	R to 212	140	---	---
	10%	---	---	---	---	---	---	---	R to 212	---	---
Potassium Bromide Kbr	--	---	180	212	140	140	140	R to 248	140	---	---
Potassium Carbonate $K_2 CO_3$	--	73	180	180	140	140	140	N	140	---	---
Potassium Chlorate $KClO_3$ (Aqueous)	--	160	180	212	140	140	140	N	140	---	---
Potassium Chloride Kcl	--	160	180	212	140	140	140	R to 212	140	---	---
Potassium Chromate $K_2 CrO_4$	--	---	180	212	140	140	140	---	140	---	---
Potassium Cyanide KCN	--	---	180	180	140	140	140	R to 212	140	---	---
Potassium Dichromate $K_2 Cr_2 O_7$	Sat'd	--	180	180	140	140	140	---	140	---	---
Potassium Ethyl Xanthate $KS_2 COC_2 H_5$	--	---	---	---	73	---	---	---	---	---	---
Potassium	--	---	180	180	140	140	140	R to	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK	
Ferricyanide $K_3 Fe(CN)_6$								248				
Potassium Ferroycanide $K_4 Fe(CN)_6 o3H_2 O$	--	---	180	180	140	140	---	R to 248	140	---	---	
Potassium Fluoride KF	--	---	180	180	140	140	140	R to 212	140	---	---	
Potassium Hydroxide KOH	4%	---	---	---	---	---	---	C to 104	---	---	---	
	10%	---	---	---	---	---	---	R to 176	---	---	---	
	20%	---	---	---	---	---	---	R to 176	---	---	---	
	25%	160	180	212	140	R to 140	140	---	R to 140	---	---	
	45%	---	---	---	---	---	---	---	---	---	R to 73	
	50%	---	---	---	---	---	---	R to 176	---	C to 104	---	
Potassium hydrogen Sulphite	10%	---	---	---	---	---	---	R to 140	---	---	---	
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---	
Potassium	--	160	180	---	140	120	---	---	120	---	---	
Hyprochlorite KclO	3%		---	---	---	---	---	--- 212	R to	---	---	---
Potassium Iodide KI	--	---	180	73	73	140	---	R to 212	140	---	---	
Potassium Nitrate	--	160	180	140	140	140	140	---	140	C to	---	

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
KNO_3	50%	---	---	---	---	---	---	R to 212	---	104	---
Potassium Orthophosphate	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Perborate	--	---	180	140	140	140	140	---	140	---	---
Potassium Perchlorate $KClO_4$	--	---	180	140	140	140	140	---	140	---	---
Potassium Permanganate $KmnO_4$	10%	---	180	73	140	140	140	R to	140 176	---	---
	20%	---	---	---	---	---	---	R to 212	---	---	---
	25%	---	180	73	73	140	---	---	140	---	---
	30%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Potassium Persulfate $K_2 S_2 O_8$	--	---	180	140	140	140	140	R to 176	140	---	---
Potassium Sulfate $K_2 SO_4$	--	160	180	180	140	140	140	R to 212	140	194	---
Potassium Sulfide $K_2 S$	--	---	180	140	---	140	140	68	140	---	---
Potassium Sulfite $K_2 SO_3 o2H_2 O$	--	---	180	140	---	140	---	---	140	---	---
Propane $C_3 H_8$	--	---	73	73	140	140	73	R to 248	140	140	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Propargyl Alochol $HC{:}CCH_2\,OH$	--	---	C to	140 180	140	140	140	---	140	---	---
Propionic Acid $CH_3\,CH_2\,CO_2\,H$	--	N	N	140	---	140	---	R to 140	140	---	---
Propyl Alcohol (Type I) $CH_3CH_2CH_2OH$	--	73	C to 73	140	140	R to 140	140	R to 122	R to 140	---	---
Propylene Carbonate	100%	---	---	---	---	---	---	---	---	---	R to 73
Propylene Dichloride $CH_3\,CHClCH_2\,Cl$	100	---	N	N	N	N	---	---	N	---	---
Propylene Oxide $CH_3\,CHCH_2\,O$	--	---	N	73	N	140	---	---	140	---	---
Pyridine $N(CH)_4\,CH$	--	---	N	C to 140	N	73	---	R to 68	73	C to 68	---
Pyrogallic Acid $C_6\,H_3\,(OH)_3$	--	---	---	---	73	--	--	---	---	---	---
Quinone $C_6\,H_4\,O_2$	--	---	---	140	---	140	---	---	140	---	---
Rayon Coagulating Bath	--	---	180	---	140	140	140	---	140	---	---
Salicylaldehyde $C_6\,H_4\,OHCHO$	--	---	---	73	N	120	---	---	120	---	---
Salicylic Acid $C_6\,H_4\,(OH)(COOH)$	--	---	---	140	140	140	--- 212	R to	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Selenic Acid Aq. H_2SeO_4	--	---	180	---	140	140	140	---	140	---	---
Silicic Acid $SiO_2 \cdot nH_2O$	--	---	180	140	140	140	140	R to 212	140	---	---
Silicone Oil	--	---	180	212	73	73	---	---	73	---	---
Silver Acetate	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Silver Chloride AgCl	--	160	180	140	140	---	---	---	---	---	---
Silver Cyanide AgCN	--	---	180	180	140	140	140	R to 212	140	---	---
Silver Nitrate $AgNO_3$	--	160	180	180	140	R to 140	C to 73	---	R to 140	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Silver Sulfate Ag_2SO_4	--	160	180	140	140	140	C to 73	---	140	---	---
Soaps	--	73	180	140	140	R to 140	140	---	R to 140	---	---
Sodium Acetate $NaC_2H_3O_2$	Sat'd	---	180	212	140	140	140	R to 212	140	---	---
Sodium Alum $AlNa(SO_4)_2 \cdot 12H_2O$	--	---	180	---	140	---	---	---	---	---	---
Sodium Aluminate $Na_2Al_2O_3$	Sat'd	---	---	---	140	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Benzoate	--	---	180	140	140	140	140	---	140	---	---
C_6H_5COONa	35%	---	---	---	---	---	---	R to 68	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bicarbonate $NaHCO_3$	--	73	180	212	140	140	140	R to 212	140	---	---
Sodium Bichromate	Sat'd	---	180	---	140	---	---	---	---	---	---
$Na_2Cr_2O_7$ o$2H_2O$	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bisulfate	--	73	180	140	140	140	140	---	140	---	---
$NaHSO_4$	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Bisulfite $NaHSO_3$	--	---	180	140	140	140	---	---	140	---	---
Sodium Borate (Borax) $Na_2B_4O_7$ o$10H_2O$	Sat'd	160	180	180	140	140	140	---	140	---	---
Sodium Bromide	Sat'd	120	180	140	140	140	140	---	140	---	---
NaBr	50%	---	---	---	---	---	---	R to 248	---	---	---
Sodium Carbonate Na_2CO_3	--	73	180	212	140	140	140	N	140	R to 140	---
Sodium Chlorate $NaClO_3$	Sat'd	---	180	140	73	140	140	N	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Chloride	---	120	180	212	140	140	140	---	140	---	---
NaCl	Sat'd	---	---	---	---	---	---	R to 212	---	194	---
	10%	---	---	---	---	---	---	R to 212	---	---	R to 176
Sodium Chlorite $NaClO_2$	25%	---	180	73	N	140	---	---	140	---	---
Sodium Chromate $Na_2 CrO_4$ o10H_2 O	--	120	180	140	---	140	---	R to 176	140	---	---
Sodium Cyanide NaCN	--	---	180	180	140	140	140	R to 212	140	---	---
Sodium Dichromate $Na_2 Cr_2 O_7$ o2H_2 O	20%	---	180	180	140	140	140	---	140	---	---
Sodium Ferricyanide $Na_3 Fe(CN)_6$ o2H_2 O	Sat'd	---	180	140	140	140	140	---	140	---	---
Sodium Ferrocyanide $Na_3 Fe(CN)_6$ o10H_2 O	Sat'd	---	180	140	140	140	140	---	140	---	---
Sodium Fluoride NaF	--	120	180	180	140	140	140	R to 212	140	---	---
Sodium Hydrogen Sulphite	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Hydroxide NaOH	1%	---	---	---	---	---	---	---	R to 140	---	---
	5%	---	---	---	---	---	---	C to 68	---	---	---
	15%	120	180	212	140	140	140	---	R to 140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
	30%	120	180	212	140	R to 140	140	N	R to 140	---	---
	40%	---	---	---	---	---	---	---	R to 140	---	---
	50%	120	180	212	140	140	140	---	140	C to 104	---
	60%	---	---	---	---	---	---	---	R to 140	---	---
	70%	120	180	212	140	140	140	---	140	---	---
Sodium Hypochlorite	--	120	180	73	73	140	140	---	140	---	N
$NaOClo5H_2O$	2% Cl	---	---	---	---	---	---	R to 212	---	---	---
	12.5% Cl	---	---	---	---	---	---	R to 68	---	---	---
Sodium Iodide NaI	--	---	180	---	140	---	---	---	---	---	---
Sodium Metaphosphate $(NaPO_3)n$	--	---	180	120	140	---	---	---	---	---	---
Sodium Nitrate $NaNO_3$	Sat'd	160	180	180	140	140	140	R to 212	140	---	---
Sodium Nitrite $NaNO_2$	--	160	180	73	140	140	140	R to 212	140	---	---
Sodium Palmitrate $CH_3(CH_2)_{14}COONa$	5%	---	180	140	140	---	---	---	---	---	---
Sodium Perborate $NaBO_2 o3H_2O$	--	120	180	73	140	73	---	---	73	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Sodium Perchlorate $NaClO_4$	--	---	180	212	140	140	---	---	140	---	---
Sodium Peroxide $Na_2 O_2$	10%	---	180	---	140	140	---	---	140	---	---
Sodium Phosphate $NaH_2 PO_4$	Acid	120	180	212	140	140	140	R to 140	140	---	---
	Alkaline		120	180	212	140	140	---	140	---	---
	Neutral		120	180	212	140	140	---	R to 212	---	---
Sodium Silicate $2Na_2 OoSiO_2$	--	---	180	140	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 140	---	---	---
	50%	---	---	---	---	---	---	R to 212	---	---	---
Sodium Sulfate Na_2SO_4	Sat'd	160	180	212	140	140	140	R to 212	---	---	---
	0.1%	---	---	---	---	---	---	R to 140	---	---	---
Sodium Sulfide Na_2S	Sat'd	160	180	212	140	140	140	---	140	C to 104	---
Sodium Sulfite Na_2SO_3	Sat'd	160	180	212	140	140	140	R to 212	140	---	---
Sodium Thiosulphate $Na_2S_2O_3o5H_2O$	--	---	180	180	140	140	140	---	140	---	---
	50%	---	---	---	---	---	---	R to 248	---	---	---
Sour Crude Oil	--	---	---	140	140	---	---	---	---	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Soybean Oil	--	---	---	73	---	140	---	---	140	---	---
Stannic Chloride $SnCl_4$	Sat'd	---	180	140	140	140	140	---	140	---	---
Stannous Chloride $SNCl_2$	15%	120	180	140	140	140	140	---	140	---	---
	Sat'd	---	---	---	---	140	---	---	140	---	---
Starch	--	---	180	140	140	140	---	---	140	---	---
Starch Solution	Sat'd	---	---	---	---	140	---	---	140	---	---
Stearic Acid $CH_3(CH_2)_{16}COOH$	--	---	180	73	140	120	150	---	120	C to 194	---
	100%	---	---	---	---	R to 120	---	---	R to 120	---	---
Stoddard's Solvent	--	---	N	---	N	73	140	---	73	---	---
Styrene $(C_6H_5CHCH_2)n$	--	---	---	73	---	C to 73	---	---	C to 73	R to 104	---
Succinic Acid $CO_2H(CH_2)_2CO_2H$	--	---	180	140	140	140	---	---	140	---	---
Sugar $C_6H_{12}O_6$	Aq.	---	180	---	140	140	---	---	140	---	---
Sulfamic Acid HSO_3NH_2	20%	--	N	180	N	---	---	---	---	---	---
Sulfate Liquors (Oil)	6%	---	180	140	140	---	---	---	---	---	---
Sulfite Liquors	6%	73	180	---	140	140	---	---	---	---	---
Sulfur	--	---	180	212	140	140	140	---	---	104	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
S											
Sulfur Chloride S_2Cl	--	---	---	C to 73	---	---	---	---	---	---	---
Sulfur Dioxide SO_2	Gas Dry	N	73	140	140	140	---	---	140	---	---
Sulfur Dioxide	Gas Wet	N	N	140	73	120	73	N	120	---	---
Sulfur Trioxide SO_3	Gas Dry	---	---	---	140	N	---	N	N	C to 68	---
Sulfur Trioxide SO_3	Gas	---	N	---	73	N	---	N	---	---	---
Sulfuric Acid H_2SO_4	5%	---	---	---	---	---	---	---	---	---	R to 73
	30%	120	180	180	140	140	140	R to 248	R to 140	---	N
	50%	73	180	140	140	120	C to 73	R to 212	R to 140	---	---
	60%	C to 73	180	73	140	120	C to 73	R to 248	---	---	---
	70%	C to 73	180	73	140	R to 120	C to 73	---	---	---	---
	80%	C to 73	180	73	140	R to 120	N	C to 248	---	---	---
	90%	C to 73	150	73	73	120	N	R to 212	---	---	---
	93%	N	140	C to 73	73	C to 73	N	---	---	---	---
	94% - 98%	N	130	C to 73	N	C to 73	N	C to 212	N	---	---
	100%	N	N	C to	N	C to	N	---	---	C to	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
				73		73				194	
Sulfurous Acid H_2SO_3	--	---	180	140	140	140	140	R to 212	140	---	---
Tall Oil	--	---	C to 180	180	140	120	---	---	120	---	---
Tannic Acid $C_{76}H_{52}O46$	10%	N	180	73	140	140	140	R to 212	140	---	---
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---
Tanning Liquors	--	160	180	73	140	120	140	---	120	---	---
Tar	--	---	N	---	N	---	---	---	---	---	---
Tartaric Acid $HOOC(CHOH)_2COOH$	--	160	180	140	140	140	140	R to	140 248	---	---
	Sat'd	---	---	---	---	---	---	R to 248	R to 176	R to 194	---
Terpineol $C_{10}H_{17}OH$	--	---	---	---	C to 140	---	---	---	---	---	---
Tetrachloroethane $CHCl_2CHCl_2$	--	---	---	C to 73	C to 140	C to 120	---	---	C to 120	---	---
Tetrachloroethylene $Cl_2C{:}CCl_2$	--	N	N	C to 73	---	---	---	---	---	---	---
Tetraethyl Lead $Pb(C_2H_5)_4$	--	---	73	73	73	---	---	---	---	68	---
Tetrahydrofuran C_4H_8O	--	N	N	C to 73	N	C to 73	C to 73	C to 68	N	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Tetralin $C_{10}H_{12}$	--	---	N	N	N	N	---	---	N	---	---
Tetra Sodium Pyrophosphate N94Pzo7o10H_2O	--	---	180	---	140	---	---	---	---	---	---
Thionyl Chloride $SOCl_2$	--	---	N	N	N	N	140	N	N	---	---
Thread Cutting Oils	--	---	73	73	73	---	---	---	---	---	---
Tin (II) Chloride		---	---	---	---	---	---	R to 212	---	---	---
Tin (IV) Chloride		---	---	---	---	---	---	R to 212	---	---	---
Titanium Tetrachloride $TiCl_4$	--	---	---	140	C to 73	120	---	---	120	---	---
Toluene (Toluol) $Ch_3C_6H_5$	--	N	N	C to 73	N	C to 120	N	---	C to 120	R to 140	R to 73
Tomato Juice	--	---	180	212	140	140	---	---	140	--	---
Transformer Oil	--	---	180	73	140	C to 120	---	---	C to 120	---	---
Transformer Oil DTE/30	--	---	180	---	140	R to 120	---	---	R to 120	---	---
Tributyl Citrate	--	---	---	C to 73	73	C to 120	---	---	C to 120	---	---
Tributyl Phosphate $(C_4H_9)PO_4$	--	---	N	C to 140	N	73	---	---	73	R to 194	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Trichloroacetic Acid Ccl_3COOH	50%	---	---	140	140	140	---	R to 104	140	---	---
	10%	---	---	---	---	140	---	---	140	---	---
Trichlorobenzene		---	---	---	---	---	---	R to 140	---	---	---
Trichloroethane		---	---	---	---	---	---	---	---	---	R to 122
Trichloroethylene $CHCl{:}CCl_2$	--	N	N	N	N	C to 120	N	R to 176	C to 68	C to 68	R to176
Triethanolamine $(HOCH_2CH_2)_3N$	--	C to 73	73	140	73	73	73	C to 104	73	---	---
Triethylamine $(C_2H_5)_3N$	--	---	---	N	140	73	---	---	73	---	---
Trimethylpropane $(CH_2OH)_3C_3H_5$	--	---	---	140	73	C to 120	---	---	C to 120	---	---
Trisodium Phosphate $NaPO_4o12H_2O$	--	73	180	140	140	140	140	---	140	---	---
Turpentine	--	N	N	N	140	C to 120	C to 73	---	C to 120	R to 140	---
Urea $CO(NH_2)_2$	--	---	180	180	140	140	140	---	140	---	---
	10%	---	---	---	---	---	---	R to 212	---	---	---
	Sat'd	---	---	---	---	---	---	R to 176	---	C to 140	---
Urine	--	160	180	180	140	140	140	---	140	---	---
Vaseline (Petroleum Jelly)	--	---	N	140	N	120	---	---	120	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
Vegetable Oil	--	---	C to 180	140	140	R to 140	---	R to 248	R to 140	---	---
Vinegar	--	73	150	140	140	140	140	---	140	194	---
Vinyl Acetate $CH_3COOCH{:}CH_2$	--	---	N	73	N	140	---	C to 68	140	---	---
Water, Acid Mine H_2O	--	160	180	140	140	140	180	---	140	---	194
Water, Deionized H_2O	--	160	180	140	140	140	180	---	140	194	176
Water, Distilled H_2O	--	160	180	212	140	140	180	R to 248	140	194	---
Water, Potable H_2O	--	160	180	212	140	140	180	R to 248	140	194	---
Water, Salt H_2O	--	160	180	212	140	140	180	---	140	194	---
Water, Sea H_2O	--	160	180	212	140	140	180	R to 248	140	194	R to 176
Water, Soft H_2O	--	160	180	212	140	140	180	---	140	194	---
Water, Waste H_2O		73	180	212	140	140	180	---	140	194	---
Whiskey	--	---	180	140	140	140	140	R to 212	140	---	---

Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK	
White Liquor	--	73	180	---	140	---	---	---	---	---	---	
Wine	--	73	180	140	140	140	140	R to 248	140	---	---	
Wines and Spirits		---	---	---	---	---	---	R to 212	---	---	---	
Xylene (Xylol) $C_6H_4(CH_3)_2$	--	N	N	N	N	N	N	C to 140	N	C to 194	---	
Zinc Acetate $Zn(C_2H_3O_2)_2o2H_2O$	--	---	180	---	---	---	---	---	---	---	---	
Zinc Carbonate $ZnCO_3$	--	---	180	140	---	140	---	R to 212	140	---	---	
Zinc Chloride $ZnCl_2$	--	120	180	180	140	140	---	---	140	---	---	
	50%	—	—	—	—	—	—	—	—	C to 73	—	
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---	
Zinc Nitrate $Zn(NO_3)_2o6H_2O$	--	160	180	180	140	140	140	---	140	---	---	
	Sat'd	---	---	---	---	---	---	R to 212	---	---	---	
Zinc Oxide		---	---	---	---	---	---	R to 212	---	---	---	
Zinc Stearate		---	---	---	---	---	---	R to 122	---	---	---	
Zinc Sulfate $ZnSO_4o7H_2O$	--	160	180	212	140	140	140	---	140	---	---	
	Sat'd		---	---	---	---	---	---	R to	---	---	---

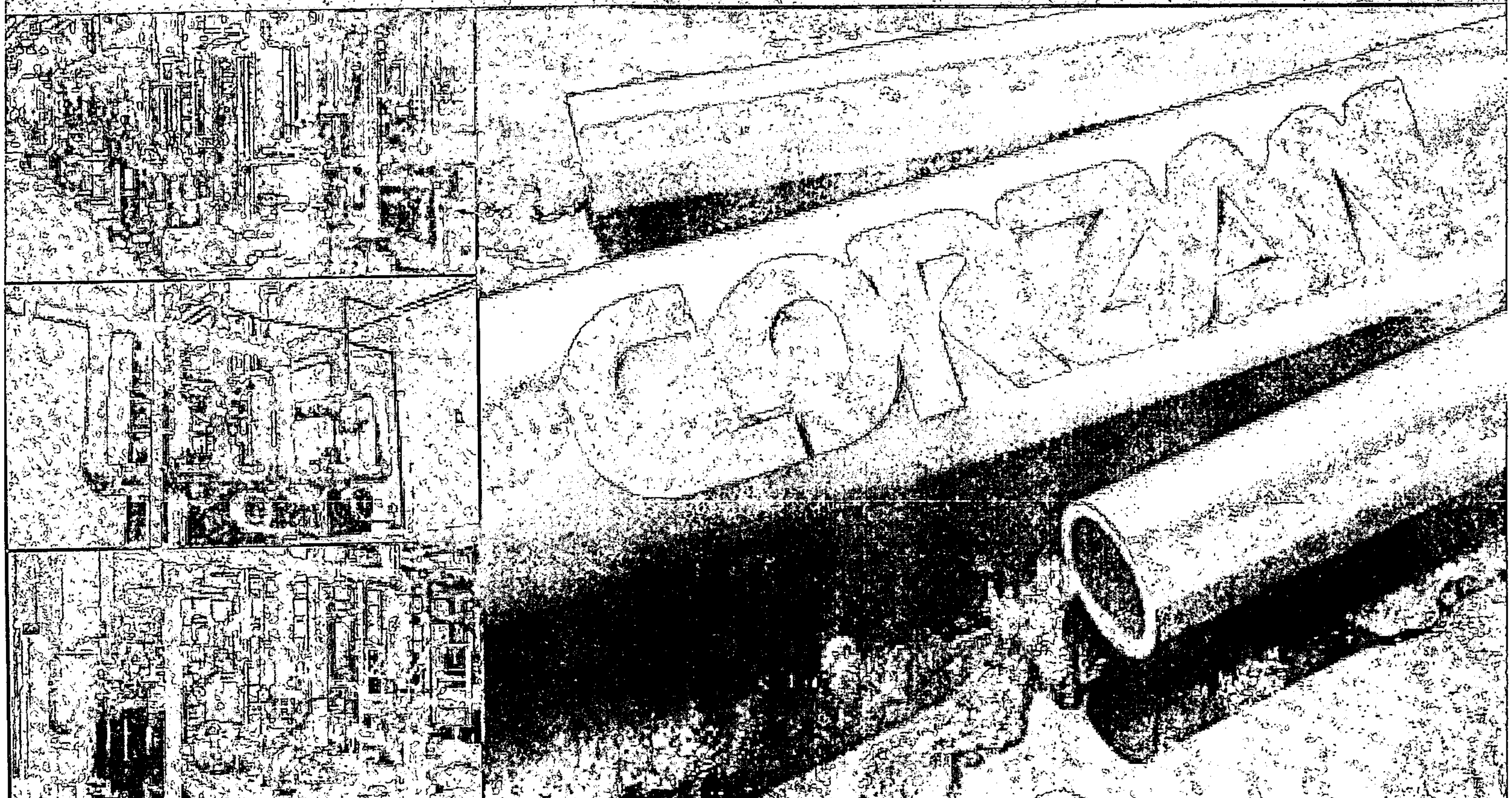
Plastics at Maximum Operating Temperature (F)

Chemicals and Formula	Concentration	ABS	CPVC	PP	PVC	PE	PB	PVDF	PEX	PA 11	PK
								212			

CORZAN™

INDUSTRIAL SYSTEMS

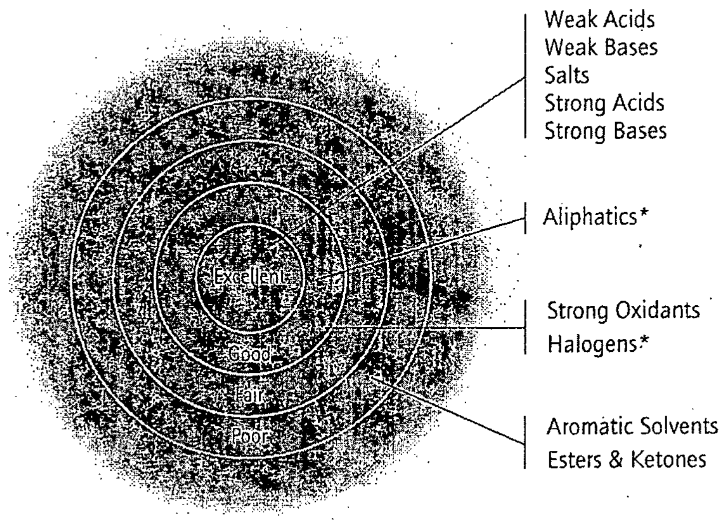
Chemical Resistance Data



noveon

The Specialty Chemicals Innovator™

Corzan™ Industrial Systems



Corzan® CPVC
Chemical Resistance

*Consult Noveon for specific data.

One of the key advantages of Corzan® CPVC is its excellent resistance to a broad range of corrosive environments. By replacing traditional materials with Corzan® CPVC, engineers can extend equipment service life and reduce maintenance, while minimizing process life-cycle costs. This technical report is intended to provide engineers and end-users with guidance as to the suitability of Corzan® industrial piping systems in corrosive applications. In general, Corzan® CPVC is inert to most mineral acids, bases, salts, and aliphatic hydrocarbons, and compares favorably to other non-metals in these chemical environments. Specific use conditions must also be considered since these will determine the chemical resistance of any thermoplastic piping system. Variables that can affect chemical resistance include chemical concentration, temperature, pressure, external stress, and final product quality. Since the number of possible use conditions is so large, the final decision regarding material suitability often must be based on in-service testing. The information contained in this report was developed to include conditions that are most often encountered in industry. CPVC samples were immersed in the particular reagent for at least 90 days at 73°F (23°C) and 180°F (82°C). Changes in weight and tensile strength for each sample were reviewed in conjunction with field experience and information gathered from various sources to develop recommendations shown. Note that these recommendations are based on specific use conditions and may not apply to all situations. For this reason, the final decision regarding material suitability must rest with the end-user. The notes following the chemical resistance chart list specific areas where caution must be used when considering Corzan® CPVC. Additional chemical resistance data will become available as testing of Corzan® CPVC continues. Consult with your product supplier or Noveon for the latest Corzan® CPVC chemical resistance information.

CORZAN™
INDUSTRIAL SYSTEMS

N.B. Information presented within this report is based on test data and field experience of CPVC manufactured by Noveon and is not intended to reflect the properties found with other suppliers of CPVC materials. To determine if your supplier is using Corzan CPVC, call the Corzan Marketing Department at 888-234-2436.

Chemical Compatibility Case Study

An excellent example of an industrial system's performance in a demanding process application is an installation at Kodak's state-of-the-art lithographic plate manufacturing facility in Colorado. At this facility Kodak manufactures more than 8,000 varieties of lithographic offset printing plates in dimensions up to ten feet long.

To manufacture the plates, large coils of aluminum are unrolled, and one side of the aluminum sheet is chemically treated to provide a grained surface, which is then coated with a light-sensitive photopolymer. After this coating step, the aluminum is cut to the appropriate dimensions and packaged.

The Kodak Story

Prior to the construction of the plate manufacturing facility in 1990, Jim Loomis, Senior Plate Manufacturing Engineer, was faced with many important design decisions. Not only would the piping material have to meet Kodak's high quality standards, but it would have to safely handle the aggressive chemicals used in the plate etching process at temperatures up to 180°F (82°C).

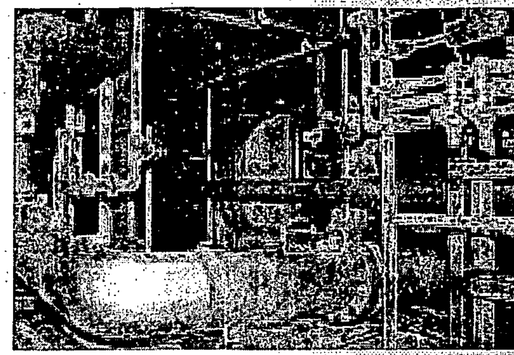
Some of the chemicals used in the process are:

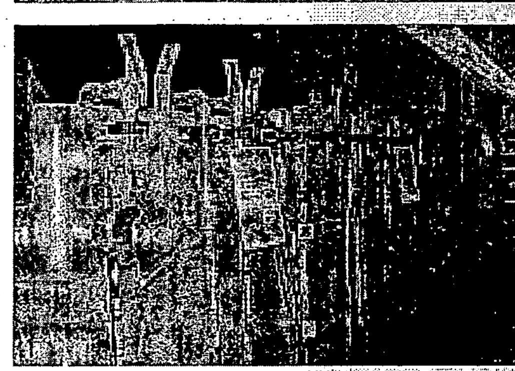
- Caustic Etching Solution
- 30% Nitric Acid
- 50% Sodium Hydroxide

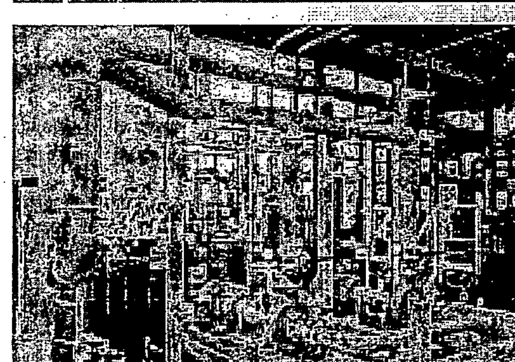
In addition, Jim wanted to specify the system in a single material for design efficiency and quality assurance. The system also had to be available in iron pipe sizes from 1" (25mm) up to 12" (300mm), including a wide variety of piping, fittings and valves.

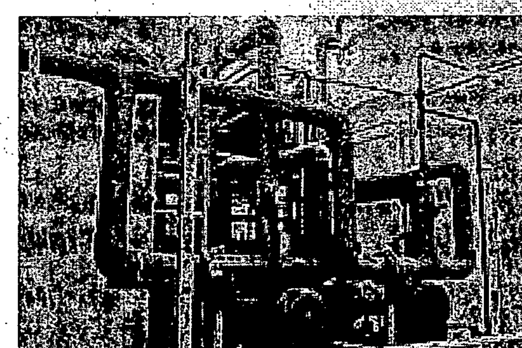
After a comprehensive materials study, one material, CPVC, was specified for the entire system. Resistance to a variety of harsh chemicals at high temperatures, as well as mechanical strength up to 180°F (82°C) were all key elements in specification decision. Jim was also extremely pleased with the economically-priced process piping and components available from a team of quality manufacturers.

If your next project includes corrosive chemicals, high temperatures, or a wide range of service conditions, think of Corzan Industrial Systems first.









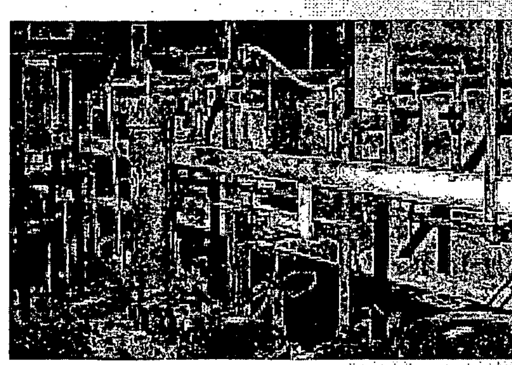


TABLE I – Chemical Resistance of Corzan® CPVC

Reagent	Temperature 73°F (23°C)	Max. Temp. (°F)
Acetaldehyde	N	N
Acetic Acid, up to 10%	R	180
Acetic Acid, greater than 10%	C	C
Acetic Acid, Glacial	N	N
Acetic Anhydride	N	N
Acetone, up to 5%	R	180
Acetone, greater than 5%	C	C
Acetone, pure	N	N
Acetyl Nitrile	N	N
Acrylic Acid	N	N
Acrylonitrile	N	N
Adipic Acid, sat'd in water	R	200
Alcohols	C	C
Allyl Alcohol	C	C
Allyl Chloride	N	N
Alum, all varieties	R	200
Aluminum Acetate	R	200
Aluminum Chloride	R	200
Aluminum Fluoride	R	200
Aluminum Hydroxide	R	200
Aluminum Nitrate	R	200
Aluminum Sulfate	R	200
Amines	N	N
Ammonia	N	N
Ammonium Acetate	R	200
Ammonium Benzoate	R	200
Ammonium Bifluoride	R	200
Ammonium Carbonate	R	200
Ammonium Chloride	R	200
Ammonium Citrate	R	200
Ammonium Dichromate	R	200
Ammonium Fluoride	R	200
Ammonium Hydroxide, 28%	N	N
Ammonium Hydroxide, 10%	N	N
Ammonium Hydroxide, 3%	C	N
Ammonium Nitrate	R	200
Ammonium Persulfate	R	[illegible]
Ammonium Phosphate	R	C
Ammonium Sulfamate	R	200
Ammonium Sulfate	R	200
Ammonium Sulfide	R	200
Ammonium Thiocyanate	R	200
Ammonium Tartrate	R	200
Amyl Acetate	N	N
Amyl Alcohol	C	C
Amyl Chloride	N	N
Aniline	N	N
Antimony Trichloride	R	200
Aqua Regia	R	N
Aromatic Hydrocarbons	N	N
Arsenic Acid	R	[illegible]
Barium Carbonate	R	200
Barium Chloride	R	200
Barium Hydroxide	R	200
Barium Nitrate	R	200
Barium Sulfate	R	200
Barium Sulfide	R	200
Beer	R	200
Beet Sugar Liquors	R	200
Benzaldehyde	N	N
Benzene	N	N
Benzoic Acid, sat'd in water	R	N
Benzyl Alcohol	N	N
Benzyl Chloride	N	N
Bismuth Carbonate	R	200
Black Liquor	R	200
Bleach, household (5% Cl)	R	200
Bleach, industrial (15% Cl)	R	200
Borax	R	200
Boric Acid	R	200
Brine Acid	R	200
Bromine	N	N
Bromine, aqueous, sat'd	R	200
Bromobenzene	N	N
Bromotoluene	N	N
Butanol	C	C
Butyl Acetate	N	N
Butyl Carbitol	N	N
Butyl Cellosolve	N	N
Butyric Acid, up to 1%	R	180
Butyric Acid, greater than 1%	C	C
Butyric Acid, pure	N	N
Cadmium Acetate	R	200
Cadmium Chloride	R	200
Cadmium Sulfate	R	200
Calcium Acetate	R	200
Calcium Bisulfide	R	200
Calcium Bisulfite	R	200
Calcium Carbonate	R	200
Calcium Chlorate	R	200
Calcium Chloride	R	200
Calcium Hydroxide	R	200
Calcium Hypochlorite	R	200
Calcium Nitrate	R	200
Calcium Oxide	R	200
Calcium Sulfate	R	200
Cane Sugar Liquors	R	200
Caprolactam	N	N
Caprolactone	N	N
Carbitol	N	N
Carbon Dioxide	R	200
Carbon Disulfide	N	N
Carbon Monoxide	R	200
Carbon Tetrachloride	N	N
Carbonic Acid	R	200
Castor Oil	C	C
Caustic Potash	R	180
Caustic Soda	R	180
Cellosolve, all types	N	N
Chloric Acid	R	180
Chlorinated Solvents	N	N
Chlorinated water (hypochlorite)	R	200
Chlorine, dry gas	N	N
Chlorine, liquid	N	N
Chlorine, trace in air	R	200
Chlorine, wet gas	N	N
Chlorine dioxide aqueous, sat'd	R	200
Chlorine water, sat'd	R	200
Chlorobenzene	N	N
Chloroform	N	N
Chromic Acid, 40% (conc.)	R	180
Chromium Nitrate	R	200
Citric Acid	R	200
Citrus Oils	N	N
Coconut Oil	N	N
Copper Acetate	R	200
Copper Carbonate	R	200
Copper Chloride	R	200
Copper Cyanide	R	200
Copper Fluoride	R	200
Copper Nitrate	R	200
Copper Sulfate	R	200
Corn Oil	N	N
Corn Syrup	R	200
Cottonseed Oil	N	N
Creosote	N	N
Cresol	N	N
Crotonaldehyde	N	N
Cumene	N	N
Cupric Fluoride	R	200
Cupric Sulfate	R	200
Cuprous Chloride	R	200
Cyclohexane	N	N
Cyclohexanol	N	N
Cyclohexanone	N	N
Detergents	C	C
Dextrin	R	200
Dextrose	R	200
Dibutyl Phthalate	N	N
Dibutyl Ethyl Phthalate	N	N
Dichlorobenzene	N	N
Dichloroethylene	N	N
Diethylamine	N	N
Diethyl Ether	N	N
Dill Oil	N	N
Dimethylformamide	N	N
Disodium Phosphate	R	200
Distilled Water	R	200
EDTA, Tetrasodium	R	200
Esters	N	N
Ethanol, up to 5%	R	180
Ethanol, greater than 5%	C	C
Ethers	N	N
Ethyl Acetate	N	N
Ethyl Acrylate	N	N
Ethyl Benzene	N	N
Ethyl Chloride	N	N
Ethyl Ether	N	N
Ethylene Bromide	N	N
Ethylene Chloride	N	N
Ethylene Diamine	N	N
Ethylene Glycol, up to 50%	R	180
Ethylene Glycol, greater than 50%	C	C
Ethylene Oxide	N	N
Ferric Chloride	R	200
Ferric Hydroxide	R	200
Ferric Nitrate	R	200
Ferric Sulfate	R	200
Ferrous Chloride	R	200
Ferrous Hydroxide	R	200
Ferrous Sulfate	R	200
Fluorine gas	N	N
Fluosilicic Acid, 30%	R	180
Formaldehyde	N	N
Formic Acid, up to 25%	R	180
Formic Acid, greater than 25%	C	N
Freons	C	C
Fructose	R	200
Gasoline	N	N
Glucose	R	200
Glycerine	R	200
Glycol Ethers	N	N
Green Liquor	R	200
Halocarbon Oils	N	N
Heptane	C	–
Hydrazine	N	N
Hydrochloric Acid	R	180
Hydrochloric Acid, 36% (conc.)	R	180
Hydrofluoric Acid, 3%	R	[illegible]
Hydrofluoric Acid, 48%	C	C
Hydrofluosilicic Acid, 30%	R	180
Hydrogen Peroxide, 50%	R	[illegible]
Hydrogen Sulfide, Aqueous	R	180
Hypochlorous Acid	R	180
Isopropanol	C	C
Ketones	N	N
Kraft Liquors	R	200
Lactic Acid, 25%	R	200
Lactic Acid, 85% (Full strength)	R	C
Lead Acetate	R	200
Lead Chloride	R	200
Lead Nitrate	R	200
Lead Sulfate	R	200
Lemon Oil	N	N
Limonene	N	N
Linseed Oil	N	N
Lithium Chloride	R	200
Lithium Sulfate	R	200
Lubricating Oil, ASTM 1, 2, 3	R	–
Magnesium Carbonate	R	200
Magnesium Chloride	R	200
Magnesium Citrate	R	200
Magnesium Fluoride	R	200
Magnesium Hydroxide	R	200
Magnesium Salts, inorganic	R	200
Magnesium Nitrate	R	200
Magnesium Oxide	R	200
Magnesium Sulfate	R	200
Maleic Acid, 50%	R	180
Manganese Sulfate	R	200
Mercuric Chloride	R	200
Mercuric Cyanide	R	200
Mercuric Sulfate	R	200
Mercurous Nitrate	R	200
Mercury	R	180
Methane Sulfonic Acid	R	180
Methanol, up to 10%	R	180
Methanol, greater than 10%	C	C
Methanol, pure	N	N
Methyl Cellosolve	N	N
Methyl Chloride	N	N
Methyl Ethyl Ketone	N	N
Methyl Formate	N	N
Methyl Isobutyl Ketone	N	N
Methyl Methacrylate	N	N
Methylamine	N	N
Methylene Chloride	N	N
Mineral Oil	R	–
Monoethanolamine	N	N
Motor Oil	R	–
Muriatic Acid	R	180
Naphthalene	N	N
Nickel Acetate	R	200
Nickel Chloride	R	200
Nickel Nitrate	R	200
Nickel Sulfate	R	200
Nitric Acid, up to 25%	R	150
Nitric Acid, 25-35%	R	130
Nitric Acid, 70%	R	105
Nitrobenzene	N	N
1-Octanol	C	[illegible]
Oils, edible	N	N
Oils, Sour Crude	[illegible]	N
Oleum	N	N
Olive Oil	N	N
Oxalic Acid, Sat'd	R	170
Oxygen	R	180
Ozonized water	R	200
Palm Oil	N	N
Paraffin	R	180
Peanut Oil	N	N
Perchloric Acid, 10%	R	[illegible]
Phenylhydrazine	N	N
Phosphoric Acid	R	180
Phosphorus Trichloride	N	N
Picric Acid	N	N
Pine Oil	N	N
Plating Solutions	R	180
Polyethylene Glycol	R	–
Potash	R	200
Potassium Acetate	R	200
Potassium Bicarbonate	R	200
Potassium Bichromate	R	200
Potassium Bisulfate	R	200
Potassium Borate	R	200
Potassium Bromate	R	200
Potassium Bromide	R	200
Potassium Carbonate	R	200
Potassium Chlorate	R	200
Potassium Chloride	R	200
Potassium Chromate	R	200
Potassium Cyanate	R	200
Potassium Cyanide	R	200
Potassium Dichromate	R	200
Potassium Ferricyanide	R	200
Potassium Ferrocyanide	R	200
Potassium Fluoride	R	200
Potassium Hydroxide	R	200
Potassium Hypochlorite	R	200
Potassium Iodide	R	200
Potassium Nitrate	R	200
Potassium Perborate	R	180
Potassium Perchlorate, sat'd	R	180
Potassium Permanganate, sat'd	R	180
Potassium Persulfate, sat'd	R	[illegible]
Potassium Phosphate	R	200
Potassium Sulfate	R	200
Potassium Sulfide	R	200
Potassium Sulfite	R	200
Potassium Tripolyphosphate	R	200
Propanol, up to 0.5%	R	180
Propanol, greater than 0.5%	C	C
Propionic Acid, up to 2%	R	180
Propionic Acid, greater than 2%	C	C
Propionic Acid, pure	N	N
Propylene Dichloride	N	N
Propylene Glycol, up to 25%	R	180
Propylene Glycol, greater than 25%	C	C
Propylene Oxide	N	N
Pyridine	N	N
Sea Water	R	200
Silicic Acid	R	–
Silicone Oil	R	–
Silver Chloride	R	200
Silver Cyanide	R	200
Silver Nitrate	R	200
Silver Sulfate	R	200
Soaps	R	200
Sodium Acetate	R	200
Sodium Aluminate	R	200
Sodium Arsenate	R	200
Sodium Benzoate	R	200
Sodium Bicarbonate	R	200
Sodium Bichromate	R	200
Sodium Bisulfate	R	200
Sodium Bisulfite	R	200
Sodium Borate	R	200
Sodium Bromide	R	200
Sodium Carbonate	R	200
Sodium Chlorate	R	200
Sodium Chloride	R	200
Sodium Chlorite	R	200
Sodium Chromate	R	200
Sodium Cyanide	R	200
Sodium Dichromate	R	200
Sodium Ferricyanide	R	200
Sodium Ferrocyanide	R	200
Sodium Fluoride	R	200
Sodium Formate	R	200
Sodium Hydroxide	R	180
Sodium Hypobromite	R	200
Sodium Hypochlorite	R	200
Sodium Iodide	R	200
Sodium Metaphosphate	R	200
Sodium Nitrate	R	200
Sodium Nitrite	R	200
Sodium Perborate	R	180
Sodium Perchlorate	R	180
Sodium Phosphate	R	200
Sodium Silicate	R	200
Sodium Sulfate	R	200
Sodium Sulfide	R	200
Sodium Sulfite	R	200
Sodium Thiosulfate	R	200
Sodium Tripolyphosphate	R	200
Soybean Oil	N	N
Stannic Chloride	R	200
Stannous Chloride	R	200
Stannous Sulfate	R	200
Starch	R	200
Stearic Acid	R	–
Strontium Chloride	R	200
Styrene	N	N
Sugar	R	200
Sulfamic Acid	R	180
Sulfur	R	–
Sulfuric Acid, (see page 7)		
Sulfuric Acid, Fuming	N	N
Sulfuric Acid, 98%	R	C 125
Sulfuric Acid, 85%	R	170
Sulfuric Acid, 80%	R	160
Sulfuric Acid, 50%	R	180
Tall Oil	C	C
Tannic Acid, 30%	R	–
Tartaric Acid	R	–
Terpenes	N	N
Tetrahydrofuran	N	N
Tetrasodiumpyrophosphate	R	200
Texanol	N	N
Thionyl Chloride	N	N
Toluene	N	N
Tributyl Phosphate	N	N
Trichloroethylene	N	N
Trisodium Phosphate	R	200
Turpentine	N	N
Urea	R	180
Urine	R	200
Vegetable Oils	N	N
Vinegar	R	200
Vinyl Acetate	N	N
Water, Deionized	R	200
Water, Demineralized	R	200
Water, Distilled	R	200
Water, Salt	R	200
Water, Swimming Pool	R	200
WD-40	C	C
White Liquor	R	200
Xylene	N	N
Zinc Acetate	R	200
Zinc Carbonate	R	200
Zinc Chloride	R	200
Zinc Nitrate	R	200
Zinc Sulfate	R	200

R = Recommended N = Not recommended C = Caution, further testing suggested — suspect with certain stress levels – = Incomplete data N.B. Given percentages are by weight.

Noted Caution Areas for CPVC

CPVC is not recommended for use with most polar organic materials including various solvents i.e., chlorinated or aromatic hydrocarbons, esters, or ketones.

Resistance of CPVC to certain other fluid mixtures such as fuel oils with moderate aromatic content cannot be determined on basis of immersion testing alone. Actual use data must be obtained.

There are a number of similarities in chemical resistance between PVC and CPVC materials. However, one must exercise caution when comparing the chemical resistance properties of CPVC to those of PVC, which are not always the same.

CPVC test samples exposed while under stress to surfactants, certain oils, or grease have shown signs of environmental stress cracking. Environmental stress cracking is a situation in which the manufactured pipe or fittings are weakened by contact with certain chemicals and cracks are propagated by external stresses. External stresses include not only the known pressure stress on a system but also stresses from sources such as expansion and installation. When CPVC is intended for use in handling such chemicals, special consideration should be taken during design and installation to avoid unusual stresses in the piping system, or advance testing of the chemical in simulated use conditions is strongly suggested.

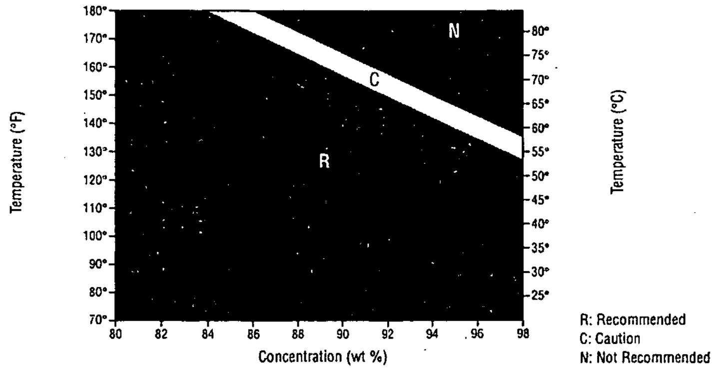
Certain organic solvents which are soluble with water, such as alcohols, may safely be handled below a certain concentration. Many of these limiting concentrations are noted in Table 1. Solvents which are insoluble in water, such as aromatics, will be absorbed by the piping over time, even when they are present at very low levels in the water. This will lead to a decreased service life expectancy for the system.

The full hydrostatic pressure rating of the pipe may not apply to the entire range of temperature and concentration designated as "recommended".

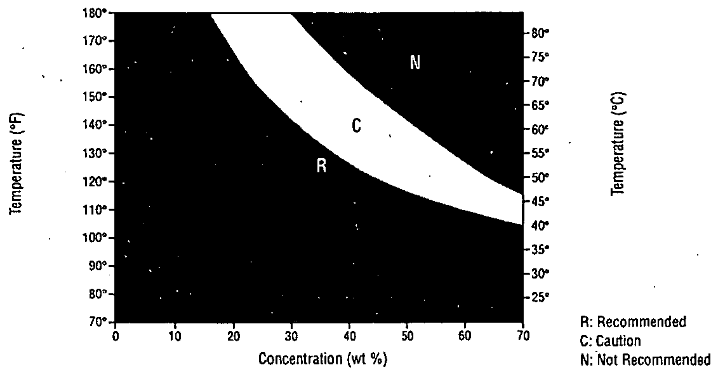
CPVC is not recommended for fuming acid service.

Contact your piping supplier or Noveon for consultation and/or the latest chemical resistance information.

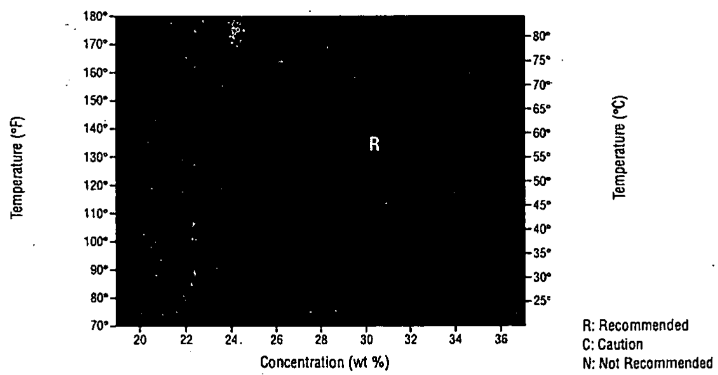
Chemical Resistance of Corzan® CPVC to Sulfuric Acid



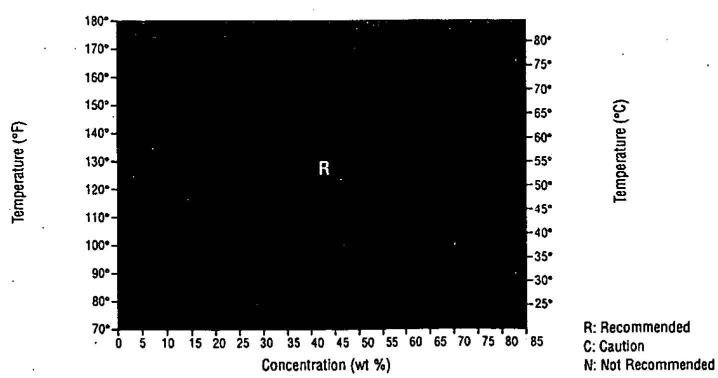
Chemical Resistance of Corzan® CPVC to Nitric Acid



Chemical Resistance of Corzan® CPVC to Hydrochloric Acid



Chemical Resistance of Corzan® CPVC to Phosphoric Acid



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Industrial Plumbing Applications

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- Inherently self-extinguishing
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- Outstanding electrical insulation characteristics
- Readily processable
- Good thermal stability and flow
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- Code approved
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- Underwriters Labortories 94-V-O and 94-5V ratings

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TABLE 2

ACTUAL CHEMICAL RESISTANCE TESTING, EXPERIENCE AND REFERENCE INFORMATION

KEY: R - Resistant NR - Not Recommended

REAGENT	TEMPERATURE 73°	180°
A		
Acetaldehyde	NR	NR
Acetic Acid, Pure	NR	NR
Acetic Acid, 10%	R	R
Acetic Acid, 20%	NR	NR
Acetic Acid, 80%	NR	NR
Acetic Acid, Glacial	NR	NR
Acetic Anhydride	NR	NR
Acetone	NR	NR
Acetyl Nitrile	NR	NR
Acrylic Acid Ethyl Ester	NR	NR
Adipic Acid	NR	NR
Alcohol, Butyl	NR	NR
Alcohol, Ethyl	NR	NR
Alcohol, Methyl, Butyl	NR	NR
Alcohol, Propyl, Ethyl	NR	NR
Allyl Alcohol, 96%	NR	NR
Allyl Chloride	NR	NR
Alum	R	R
Aluminum Alum	R	R
Aluminum Chloride	R	R
Aluminum Fluoride	R	R
Aluminum Hydroxide	R	R
Aluminum Oxychloride	R	R
Aluminum Nitrate	R	R
Aluminum, Sulfate	R	R
Ammonia (Liquid)	NR	NR
Ammonium Acetate	R	R
Ammonium Alum	R	R
Ammonium Bifluoride	R	R
Ammonium Bisulfate	R	R
Ammonium Carbonate	R	R
Ammonium Chloride	R	R
Ammonium Dichromate	R	R
Ammonium Fluoride, 25%	NR	NR
Ammonium Hydroxide	NR	NR
Ammonium Metaphosphate	R	R
Ammonium Nitrate	R	R
Ammonium Persulfate	R	R
Ammonium Phosphate	R	R
Ammonium Sulfate	R	R
Ammonium Sulfide	R	R
Ammonium Thiocyanate	R	R
Amyl Acetate	NR	NR
Amyl Alcohol	NR	NR
Amyl Chloride	NR	NR
Aniline	NR	NR
Aniline Chlorohydrate	NR	NR
Aniline Hydrocholorate	NR	NR
Anthraquinone	R	NR
Anthraquinonesulfonic Acid	R	R
Antimony Trichloride	R	R
Aqua Regia	NR	NR
Aromatic Hydrocarbons	NR	NR
Arsenic Acid, 80%	R	R
Arsenic Trioxide (Powder)	R	R
Arylsufonic Acid	R	NR
B		
Barium Carbonate	R	R
Barium Chloride	R	R
Barium Hydroxide	R	R
Barium Nitrate	R	R
Barium Sulfate	R	R
Barium Sulfide	R	R
Beer	R	R
Beet Sugar Liquors	R	R
Benzaldehyde, 10%	NR	NR
Benzaldehyde, Above 10%	NR	NR
Benzene	NR	NR
Benzoic Acid	R	NR
Bismuth Carbonate	R	R
Black Liquor	R	R
Bleach (12% Cl)	R	R
Borax	R	R
Boric Acid	R	R
Bromic Acid	R	R
Bromine	NR	NR
Bromobenzene	NR	NR
Bromine Water	NR	NR
Butadiene	NR	NR
Butanol, Primary	NR	NR
Butanol, Secondary	NR	NR
Butyl Acetate	NR	NR
Butyl Alcohol	NR	NR
Butyl Mercaptan	NR	NR
Butyl Phenol	R	NR
Butyne Diol	NR	NR
Butyric Acid	NR	NR
C		
Cadmium Cyanide	R	R
Calcium Bisulfide	R	R
Calcium Bisulfite	R	R
Calcium Carbonate	R	R
Calcium Chlorate	R	R
Calcium Chloride	R	R
Calcium Hydroxide	R	R
Calcium Hypochlorite	R	R
Calcium Nitrate	R	R
Calcium Oxide	R	R
Calcium Sulfate	R	R
Carbon Bisulfide	NR	NR
Carbon Dioxide	R	R
Carbon Monoxide	R	R
Carbon Tetrachloride	NR	NR
Carbonic Acid	R	R
Caustic Potash	R	R
Celosolve	NR	NR
Caustic Soda	R	R
Chloracetic Acid	R	NR
Chloral Hydrate	R	R
Chloric Acid, 20%	R	R
Chloride (Water)	R	R
Chlorine Gas (Dry)	NR	NR
Chlorine Gas (Wet)	NR	NR
Chlorine (Water)	R	R
Chlorobenzene	NR	NR
Chloroform	NR	NR
Chloropicrin	NR	NR
Chlorosulfonic Acid	R	NR
Chlorox Bleach Solution	R	R
Chrome Alum	R	R
Chromic Acid, 10%	R	R
Chromic Acid, 50%	NR	NR
Citric Acid	R	R
Coconut Oil	NR	NR
Copper Carbonate	R	R
Copper Chloride	R	R
Copper Cyanide	R	R
Copper Fluoride	R	R
Copper Nitrate	R	R
Copper Sulfate	R	R
Corn Syrup	R	R
Cottonseed Oil	NR	NR
Cresol	NR	NR
Cresylic Acid, 50%	R	R
Crotonaladehyde	NR	NR
Crude Oil	R	NR
Cupric Fluoride	R	R
Cupric Sulfate	R	R
Cuprous Chloride	R	R
Cyclohexanol	NR	NR
Cyclohexanone	NR	NR
D		
Detergents	R	R
Dextrin	R	R
Dextrose	R	R
Dizao Salts	R	R
Dimethyl Hydrazine	NR	NR
Dimethylamine	NR	NR
Dioctylphthalate	NR	NR
Disodium Phosphate	R	R
Distilled Water	R	R
E		
Esters	NR	NR
Ethers	NR	NR
Ethyl Acetate	NR	NR
Ethyl Acrylate	NR	NR
Ethyl Alcohol	NR	NR
Ethyl Chloride	NR	NR
Ethyl Ether	NR	NR
Ethylene Bromide	NR	NR
Ethylene Chlorohydrin	NR	NR
Ethylene Dichloride	NR	NR
Ethylene Glycol (100%)	NR	NR
Ethylene Glycol (50%)	R	R
Ethylene Oxide	NR	NR
F		
Fatty Acids	R	R
Ferric Acetate	R	NR
Ferric Chloride	R	R
Ferric Hydroxide	R	R
Ferric Nitrate	R	R
Ferric Sulfate	R	R
Ferrous Chloride	R	R
Ferrous Nitrate	R	R

Reagent	Temperature 73°	Temperature 180°
Ferrous Sulfate	R	R
Fish Solubles	R	R
Fluorine Gas	NR	NR
Fluosilicic Acid, (25%)	R	NR
Formaldehyde	NR	NR
Formic Acid	R	NR
Fructose	R	R
Fruit Juices And Pulp	R	R
Furfural	NR	NR
Freons	NR	NR
Carene 500	NR	NR

G

Reagent	Temperature 73°	Temperature 180°
Gallic Acid	R	R
Gasoline	NR	NR
Glucose	R	R
Gas (Coke Oven)	NR	NR
Glycerine	R	R
Glycolic Acid	R	R
Grapesugar	R	R
Gulfpride No. 10 Oil	R	R

H

Reagent	Temperature 73°	Temperature 180°
Heptane	R	NR
Hexane	R	NR
Hexanol, Tertiary	NR	NR
Hydrobromic Acid, 20%	R	R
Hydrochloric Acid, 10%	R	R
Hydrochloric Acid Conc. (36%)	R	NR
Hydrofluoric Acid, 48%	NR	NR
Hydrofluorsilic Acid	R	NR
Hydrogen Peroxide, 30%	R	R
Hydrogen Phosphide	R	R
Hydrogen Sulfide, Aqueous	R	R
Hydroquinone	R	R
Hydroxylamine Sulfate	R	R
Hypochlorous Acid	R	R
Hydrazine (Anhydrous), 97%	NR	NR

I

Reagent	Temperature 73°	Temperature 180°
Iodine	NR	NR
Isopropanol	NR	NR

K

Reagent	Temperature 73°	Temperature 180°
Kerosene	NR	NR
Ketones	NR	NR
Kraft Liquors	NR	NR

L

Reagent	Temperature 73°	Temperature 180°
Lactic Acid, 80%	R	NR
Lactic Acid, 25%	R	R
Lauric Acid	R	R
Lauryl Chloride	NR	NR
Lead Acetate	R	R
Lead Chloride	R	R
Lead Nitrate	R	R
Lead Sulfate	R	R
Linoleic Acid	R	R
Linoleic Oil	R	NR
Linseed Oil	NR	NR
Lithium Bromide	R	R
Lubricating Oil, ASTM No. 1	R	R
Lubricating Oil, ASTM No. 2	R	R
Lubricating Oil, ASTM No. 3	R	NR
Lux Liquid	R	R

M

Reagent	Temperature 73°	Temperature 180°
Machine Oil	R	R
Magnesium Carbonate	R	R
Magnesium Chloride	R	R
Magnesium Citrate	R	R
Magnesium Hydroxide	R	R
Magnesium Nitrate	R	R
Magnesium Sulfate	R	R
Maleic Acid	R	R
Malic Acid	R	R
Manganese Chloride	R	R
Mercuric Chloride	R	R
Mercuric Cyanide	R	R
Mercuric Sulfate	R	R
Mercurous Nitrate	R	R
Mercury	R	R
Methylamine	NR	NR
Methyl Alcohol	NR	NR
Methyl Chloride	NR	NR
Methy Ethyl Ketone	NR	NR
Methyl Iso-Butyl Ketone	NR	NR
Milk	R	R
Mineral Oils	R	R
Mixed Acids	R	R
Molasses	R	R
Muriatic Acid	R	NR

N

Reagent	Temperature 73°	Temperature 180°
Naptha	R	NR
Napthalene	NR	NR
Nickel Chloride	R	R
Nickel Nitrate	R	R
Nickel Sulphate	R	R
Nicotine	R	R
Nicotine Acid	R	R
Nitric Acid, 10%	R	R
Nitric Acid, 25%	R	R
Nitric Acid, 25-70%	R	NR
Nitrobenzene	NR	NR
Nitroglycerine	NR	NR
Nitrous Oxide	R	R
Nitroglycol	NR	NR

O

Reagent	Temperature 73°	Temperature 180°
Oils And Fats	NR	NR
Oils, Sour Crude	NR	NR
Oleic Acid	R	R
Oleum	NR	NR
Oxalic Acid	R	NR
Oxygen	R	R
Ozone	R	R

P

Reagent	Temperature 73°	Temperature 180°
Palmitic Acid, 10%	R	R
Palmitic Acid, 70%	NR	NR
Paraffin	R	R
Peracetic Acid, 40%	NR	NR
Perchloric Acid, 10%	R	R
Perchloric Acid, 15%	NR	NR
Perchloric Acid, 70%	NR	NR
Petroleum Liquifier	R	R
Phenylhydrazine	NR	NR
Phenylhydrazine Hydrochloride	NR	NR
Phosgene, Liquid	NR	NR
Phosphoric Acid, 10%	R	R
Phosphoric Acid, 25%	R	R
Phosphoric Acid, 75%	R	R
Phosphoric Acid, 85%	R	R
Photographic Solutions:		
Dk No. 3	R	R
Dektal Developer	R	R
Kodak Fixer	R	R
Kodak Short Stop	R	R
Picric Acid	NR	NR
Potash (Sat. Aq.)	R	R
Potassium Alum	R	R
Potassium Amyl Xanthate	NR	NR
Potassium Bicarbonate	R	R
Potassium Bichromate	R	R
Potassium, Bisulfate	R	R
Potassium Borate	R	R
Potassium Bromate	R	R
Potassium Bromide	R	R
Potassium Carbonate	R	R
Potassium Chromate	R	R
Potassium Chlorate	R	R
Potassium Chloride	R	R
Potassium Cyanide	R	R
Potassium Dichromate	R	R
Potassium Ethyl Xanthate	NR	NR
Potassium Ferricyanide	R	R
Potassium Ferrocyanide	R	R
Potassium Fluoride	R	R
Potassiujm Hydroxide	R	R
Potassium Nitrate	R	R
Potassium Perborate	R	R
Potassium Perchlorate	R	R
Potassium Permanganate	R	R
Potassium Persulfate	R	R
Potassium Sulfate	R	R
Propyl Alcohol	NR	NR
Propylene Dichloride	NR	NR
Plating Solutions:		
Brass	R	R
Cadmium	R	R
Copper	R	R
Gold	R	R
Indium	R	R
Lead	R	R

ProTherm®

CPVC COMPOUNDS

CHEMICAL RESISTANCE

ProTherm CPVC compounds have excellent chemical resistance properties when exposed to a wide range of chemicals and environments. Generally, ProTherm CPVC compounds are resistant to aliphatic hydrocarbons, bases, mineral acids, salts and oxidants. However, end use conditions must be considered before determining the acceptability of using ProTherm CPVC compounds.

Table 1 contains actual chemical immersion test data at 73°F (23°C) and 180°F (82°C). Tensile strength and weight change were measured after 90 day immersion.

Table 2 contains recommendations based on actual chemical resistance testing, experience and reference information. It is recommended that in-service testing be conducted prior to determining the acceptability of using ProTherm CPVC compounds.

TABLE 1

CHEMICAL RESISTANCE TESTING – 90 DAY IMMERSION

CHEMICAL	CONCENTRATION (WEIGHT %)	IMMERSION TEMPERATURE	WEIGHT CHANGE (%)	TENSILE CHANGE (%)
Sodium Hydroxide	50%	73°F/23°C	0.0	-1.3
Sodium Hydroxide	50%	180°F/82°C	-0.1	2.7
Potassium Hydroxide	45%	73°F/23°C	0.1	-2.8
Potassium Hydroxide	45%	180°F/82°C	0.0	3.0
Sulfuric Acid	80%	73°F/23°C	0.0	-1.2
Sulfuric Acid	80%	180°F/82°C	-0.4	-4.3
Sulfuric Acid	93.5%	73°F/23°C	0.0	-2.6
Nitric Acid	25%	73°F/23°C	0.1	-1.7
Nitric Acid	25%	180°F/82°C	0.5	1.2
Nitric Acid	50%	73°F/23°C	0.1	-1.6
Nitric Acid	50%	180°F/82°C	0.6	2.2
Hydrochloric Acid	36%	73°F/23°C	0.3	-3.2
Hydrochloric Acid	36%	180°F/82°C	1.3	6.1
Deionized Water	100%	73°F/23°C	0.2	0.1
Deionized Water	100%	180°F/82°C	0.6	3.3
Sodium Borate	Saturated	73°F/23°C	0.2	0.1
Sodium Carbonate	Saturated	73°F/23°C	0.1	-1.4
Sodium Carbonate	Saturated	180°F/82°C	0.4	2.2
Calcium Chloride	43%	73°F/23°C	0.1	-1.7
Calcium Chloride	43%	180°F/82°C	0.2	0.8
Bleach, Household	—	73°F/23°C	0.1	-0.6
Potassium Persulfate	2%	73°F/23°C	0.2	-1.3
Hydrogen Peroxide	30%	73°F/23°C	0.4	-0.6
Heptane	100%	73°F/23°C	0.0	-1.3
Methanol	100%	73°F/23°C	0.6	-6.5

Georgia Gulf **ProTherm**®

CPVC COMPOUNDS

CHEMICAL STRESS RESISTANCE

Residential Plumbing Applications

To determine the chemical stress resistance of ProTherm compounds to a variety of substances that may be encountered during residential plumbing applications, injection molded test bars were prepared with a knit line using ProTherm products. The test bars were bent to induce high stress and placed into an apparatus that held them in place.

The test materials were then placed on the bars in the knit line and monitored for 14 days. Any cracking of the test bars was considered a failure.

Dioctyl Phthalate (DOP) was used as a control as it is known to generate chemical stress cracking in rigid vinyl.

Several thread sealants, solvent cements, primers, and soldering pastes were tested.

MATERIAL	RESULT
Control	pass
Dioctyl Phthalate (DOP)	failed at 4 hours
Rector Seal-Thread Sealant	pass
LA-CO TOT - Pipe Joint Compound	failed at 24 hours
LA-CO - Soldering Paste	pass
Oatey-No. 5 Solder Paste	pass
Bridgit-Soldering Paste	pass
EZ Weld-One step CPVC Solvent Cement	pass
Loctite-Pipe Sealant	pass
LA-CO Slic-tite - Thread Sealant	failed at 4 days
CPVC-PVC Purple Primer	failed at 24 hours
Harvey's Soil Seal	pass

Testing will be ongoing.

Note: Material manufacturers may change formulations without notification to the consumer.

ORION

*******TECHNICAL BULLETIN ********TECHNICAL BULLETIN********

TO: SALES REPRESENTATIVES

FROM: MICHAEL DENNEHY

SUBJECT: DISADVANTAGES OF SPEARS® LABWASTE™ CPVC CORROSIVE DRAINAGE SYSTEM

DATE: 9/30/02

Recently, Spears Manufacturing Company has introduced a line of CPVC Schedule 40 pipe and drainage fittings trademarked as their LabWaste™ System, which is intended to compete against polypropylene, the standard of the industry. The product literature makes many claims and broad statements as to the benefits of the product. However, the reality of the product is vastly different than the overstated and misleading marketing claims. In many respects, the product falls far short of the requirements for an acid waste system designed to withstand the rigors of laboratory use and the test of time.

A close look at the literature from the manufacturer reveals many of the inherent deficiencies and contradictions. The following is a summary of some of the key points:

(1) CPVC has substantially lower chemical resistance than polypropylene with respect to many of the most common acids and bases used in research institutions. This fact can be documented despite claims in the "front" of the Spears Literature to the contrary. Some specific examples include Nitric Acid, Hydrofluoric Acid, Acetic Acid (vinegar) and Ammonium Hydroxide, each of which will adversely affect CPVC at moderate to high concentrations whereas PP is highly resistant to each of these compounds. These are not extreme "fluff" examples being pointed out for affect. They are among the top ten research chemicals in use in typical research facilities.

(2) In some chemicals for which the chemical resistance charts shows resistance, CPVC can fail while in service due to "chemical stress" cracking, if the material is under stress. An example pointed out right in the caution statements of their literature has to do with stress cracking caused by "surfactants". Well guess what another synonym for surfactants is.....soaps! Imagine a research lab facility where soaps "surfactants" are restricted from use. A common cause of stresses is thermal expansion and contraction due to exothermic reactions from the mixing of acids, bases, water and surfactants! Stresses are also induced from a number of other factors including installation stresses due to bending, joining, disposal of hot waste, direct burial loads, and many other causes.

(3) CPVC can not be tested in most applications for at least 24 hours after joining due to cure time of the joints, and up to a week in cold weather applications. Imagine telling that to a contractor in Chicago who is installing a project in the middle of winter. Also, there is no mechanical joining method available for joining this product in tough to reach or tough to get

to areas, nor is it possible to "dry assemble" the system like in an Electrofusion application. Imagine contractors performing tie-ins with major branch lines that have to be moved axially to be inserted into one another. It is as cumbersome as socket fusion, and even trickier in hot, dry weather when the solvent cement is drying quicker than the work can be performed.

(4) CPVC is not listed by any major plumbing code (e.g. UPC, IPC, etc.) for corrosive waste applications, nor is the specific product listed for such use.

(5) The literature attempts to confuse manufacturers into thinking that the product is suitable for use in plenums. It has not been tested to ASTM E 84, nor U.L. listed and is not acceptable. CAN 102.2-M88 is not E-84 and will not be acceptable to most building codes for use in plenums as a result.

There are other inadequacies with CPVC (single-manufacturer, support issues, breakage in cold weather temperature shock during rapid temperature changes, etc.), as it pertains to acid waste applications. However, the fact that this product lacks the necessary approvals (Plumbing Code Listings, U.L. 723 Listing), should in and by itself make this product inadequate for use in a typical acid waste application in a return air plenum application

If you have any further questions concerning the use of thermoplastic piping in acid waste, or for acid waste in fire rated areas, contact the Technical Services Department of Orion Fittings, Inc. at (913)-342-1653, or fax us at (800) 777-1653.

November 5, 2002

Mr. Thom Lloyd
PVF Marketing
113 Edgewater Branch Drive
P.O. Box 57577
Jacksonville, FL 32441

Dear Thom:

Re: ***CPVC usage in acid waste drainage systems***

I am writing this letter in response to your recent questions. First, let me say that all thermoplastic materials have a place in the industrial market; however, some are better suited to specific applications due to chemical concentrations, temperature, pressure, construction codes, etc. This letter is intended to highlight a number of issues an end-user or engineer should consider before using a CPVC acid waste system.

Recently, Spears® Manufacturing Company introduced a line of CPVC Schedule 40 pipe and drainage fittings trademarked as their LabWaste™ CPVC Corrosive Waste Drainage System. This system is intended to compete against our polypropylene ENFIELD® and LABLINE™ acid waste systems.

Acid waste piping systems are subject to a variety of chemicals at varying concentrations and temperatures. It is this uncertainty that warrants additional attention during design and has been the dominant factor for the specification of a polypropylene system.

Chemical Resistance of CPVC vs Polypropylene

Laboratories and research facilities are, by nature, places of uncertainty. Constant testing and analysis results in the continuous creation of varied waste chemicals. For this reason the acid waste system should be specified in a manner that will ensure the system is capable of handling the chemicals that are emptied into the system.

In the case of acid waste, CPVC has a lower chemical resistance than polypropylene when exposed to: carboxylic acids including acetic acid and formic acid, ammonium hydroxide, formaldehyde and hydrofluoric acid.

Common immiscible vegetable oils including corn oil, cottonseed oil, and castor oil will cause stress cracking in CPVC acid waste systems.

The main chemical concern for the use of CPVC in acid waste systems involves the disposal of detergents. These include non-ionic detergents, especially ethoxylates and/or propoxylates. These chemicals can cause stress cracking. The risk of stress cracking is greatly increased when there is a possibility of the drains drying out. It is known that non-ionic detergents can react with caustic solutions to produce byproducts such as glycol-ethers. If such a reaction occurred within a drain, a polypropylene system would survive; a CPVC system could prematurely fail.

Joining Process: CPVC vs Polypropylene

Spears® CPVC pipe and fittings are joined together by solvent cement. This joining process can only be completed one joint at a time. CPVC solvent cement joints in most applications must be allowed to cure for at least 24 hours (even longer in cold temperatures) before pressure-testing the system. If leaks are detected the joint must be hot gas welded or cut out and replaced. This is a lengthy process that may require additional equipment and expertise.

Polypropylene acid waste systems have a number of distinct advantages. Multiple electrofusion joints can be completed simultaneously. The acid waste system can be immediately tested after the fusion cycle. Electrofusion joints can be re-connected to the machine and re-fused if a leak is detected. After an electrofusion joint is tested and verified, it will never leak.

IPEX Inc. LABLINE™ mechanical joints can be tightened and re-opened if necessary. Spears® LabWaste™ CPVC systems, comprised solely of solvent cement joints, seems limiting by nature.

Standards

Today there is no known standard that covers the design, manufacture, and testing of a CPVC acid waste system. Spears® LabWaste™ CPVC system is not IAPMO listed or third-party certified by CSA or NSF.

IPEX Inc. acid waste system is third-party certified by NSF to ASTM F1412, ASTM D4101, ASTM D635 and CSA B181.3 "Polyolefin laboratory drainage systems". For the entire list of IPEX Inc. acid waste system standards, see IPEX Inc. Enfield® and LABLINE™ letters of compliance.

Current industry standards for acid waste systems in the US dictate that all materials contained within return air plenums comply with ASTM E84 and have a flame spread rating less than 25 feet and a smoke development classification of less than 50 feet. Spears® LabWaste™ pipe and fittings have not been tested to these industry-wide regulations.

If you have any further questions concerning the use of thermoplastic piping in acid waste, or for acid waste systems in fire-rated locations, please feel free to contact the Technical Sales department of IPEX Inc. at (800) 463-9572.

Yours truly,

Patrick Fedor
Regional Engineer, Industrial, US

cc: Regional Managers

Chemical Resistance Tables

Resistance Rating Codes
R = Recommended
C = Use with Caution.
N = Not Recommended.
--- = No data available

IMPORTANT NOTE: Chemical Resistance data is provide for material compatibility information purposes only and in no way addresses the legal discharge of chemicals into any waste system, some of which may be prohibited by law. Nor does the data address the compatibility of chemical mixtures, issues of hazardous decomposition, or other potentially dangerous circumstances that might be involved. Data is applicable to laboratory drainage systems only and may not be suitable for continuous service or pressure applications.

CHEMICAL	RATING
A	
Acacia, Gum Arabic	R
Acetaldehyde	R
Acetamide	R
Acetic Acid Vapor 25%	R
Acetic Acid 60%	R
Acetic Acid 85%	R
Acectic Acid Glacial	R
Acetic Anhydride	R
Acetone	R
Acetophenone	C
Acetyl Chloride	R
Acetylene	N
Acetylnitrile	R
Acetylsalicylic acid, aspirin	R
Acrylic Acid	R
Acrylonitrile	R
Adenine, 6-aminopurine	R
Adenosine Triphosphate	R
Adipic Acid	R
Agarose	R
Alizarin stain Mordant Red 11	R
Alizarin Red S Mordant Red 3	R
Alizarin Yellow R Mordant Orange 1	R
Allyl Alcohol	R
Allyl Chloride	N
Aluminum Acetate	R
Aluminum Ammonium	R
Aluminum Chloride	R
Aluminum Fluoride	R
Aluminum Hydroxide	R
Aluminum Nitrate	R
Aluminum Oxychloride	R
Aluminum Potassium	R
Aluminum Potassium Sulfate, Alum	R
Aluminum Sulfate	R
Ammonia Anhydrous	R
Ammonia Gas	R
Ammonia Liquid	R
Ammonia Acetate	R
Ammonium Bicarbonate	R
Ammonium Biflouride	R
Ammonium Bisulfide	R
Ammonium Bromide	R
Ammonium Carbonate	R
Ammonium Chloride	R
Ammonium Citrate	R
Ammonium Dichromate	R
Ammonium Dihydrogen Phosphate	R
Ammonium Ferric Sulfate	R
Ammonium Ferrous Sulfate	R
Ammonium Fluoride 10%	R
Ammonium Fluoride 25%	R
Ammonium Hydroxide 10% - 28%	R
Ammonium Hydroxide 100%	R
Ammonimu Iodide	R
Ammonium Nitrate	R
Ammonium Persulfate	R
Ammonium Phosphate Monbasic/Dibasic	R
Ammonium Sulfate	R
Ammonium Sulfide	R
Ammonium Sulfite	R
Ammonium Thiocyanate	R
Amyl Acetate	C
Amyl Alcohol 1%	R
Amyl Alcohol >1%	C
n-Amyl Chloride	C
Aniline	C
Aniline Chlorohydrate	C
Aniline Hydrochloride	C
Anthraquinone	R
Anthraquinone Sulfonic Acid	R
Antimony Trichloride	R
Aqua Regia	R
Argon	—
Arsenic Acid	R
Aryl Sulfonic Acid	R
Asorbic Acid	R
L-Asparagine	R
Asphalt	N
B	
Barium Acetate	R
Barium Carbonate	R
Barium Chloride	R
Barium Hydroxide	R
Barium Nitrate	R
Barium Sulfate	R
Barium Sulfide	R
Beer	R
Beer Sugar Liquors	R
Benzaldehyde	R
Benzene	C
Benzene Sulfonic Acid	R
Benzoic Acid	R
Benzyl Alcohol	R
Bismuth Carbonate	R
Biuret	R
Black Liquor	R
Bleach 5%	R
Bleach 12%	R
Blood	R
Borax	R
Boric Acid	R
Brake Fluid	—
Brine	R
Brilliant Blue G-250	R
Brilliant Blue R-250	R
Brilliant Cresyl Blue	R
Brilliant Green	R
Bromcresal Green	R
Bromcresal purple	R
Bromic Acid	R
Bromine Liquid	R
Bromine Vapor	R
Bromine Water	R
Bromotoluene	—
Bromphenol Blue	R
Bromthymol Blue	R
Butadiene	R
Butane	R
Butyl Acetate	C
Butyl Alcohol	C
Butyl Cellosolve	R
n-Butyl Chloride	—
Butylene (C)	—
Butyl Phenol	C
Butyl Phthalate	—
Butyl Stearate	—
Butynediol	—
Butyric Acid	R
C	
Cadium Cyanide	R
Calcium Acetate	R
Calcium Bisulfide	R
Calcium Bisulfate	R
Calcium Carbonate	R
Calcium Chlorate	R
Calcium Chloride	R
Calcium Fluoride	R
Calcium Hydroxide	R
Calcium Hypochlorite	R
Calcium Nitrate	R
Calcium Oxide	R
Calcium Sulfate	R
Camphor	—
Cane Sugar Liquors	R
Caprylic Acid	—
Carbitol	—
Carbolic Acid	R
Carbon Dioxide Dry	R
Carbon Dioxide Wet	R
Carbon Disulfide	C
Carbon Monoxide	R
Carbon Tetrachloride	N
Carbonic Acid	R
Castor Oil	C
Caustic Potash	R
Caustic Soda	R
Cellosolve	C
Cellosolve Acetate	R
Chloral Hydrate	R
Chloramine	R
Chloric Acid	R
Chloric Acid 20%	R
Chlorine, Aqueous	R
Chlorinated Water 10 PPM	R
Chlorinated Water Sat'd	R
Chloroacetic Acid	R
Chloroacetyl Chloride	—
Chlorobenzene	N
Chlorobenzyl Chloride	N
Chloroform	N
Chlorophenol Red	R
Chloropicrin	—
Chlorosulfonic Acid	R
Chromic Acid 10%	R
Chromic Acid 30%	R
Chromic Acid 40%	R

CHEMICAL	RATING
Chromic Acid 50%	C
Chromium	R
Chromium Tetroxide	R
Citric Acid	R
Clayton Yellow	R
Coconut Oil	C
Coffee	R
Congo Red solution	R
Copper Acetate	R
Copper Carbonate	R
Copper Chloride	R
Copper Cyanide	R
Copper Fluoride	R
Copper Nitrate	R
Copper Sulfate	R
Corn Oil	C
Corn Syrup	R
Cottonseed Oil	C
m-Cresal Purple	R
Cresal Red	R
Creosote	N
Cresol	N
Cresylic Acid	R
Croton Aldehyde	R
Crude Oil	R
Cumene	C
Cupric Chloride	R
Cupric Fluoride	R
Cupric Nitrate	R
Cupric Sulfate	R
Cuprous Chloride	R
Cyclohexane	R
Cyclohexanol	R
Cyclohexanone	R
D	
Decahydronapthalene	R
Detergents	R
Dexrin	R
Dextrose	R
Diacetone Alcohol	R
Diastase of malt	R
Dibutoxyethyl Phthalate	N
Dibutyl Ether	R
Dibutyl Phthalate	N
Dibutyl Sebacate	N
Dichlorobenzene	R
Dichloroethylene	N
2,6 – Dichloroindophenal	R
Diesel Fuels	R
Diethylamine	R
Diethyl Cellosolve	R
Diethyl Ether	R
Diglycolic Acid	R
Dimethylamine	R
Dimethyl Formamide	R
Dimethylhydrazine	R
Dimethyl Phthalate	N
Dimethyl Sulfoxide	R
Dioctyl Phthalate	N
Dodecyl Alcohol	R
Dodecyl Sulfate	R
Dioxane	R
Diphenyl Oxide	—
Disodium Phosphate	R
Drierite	R
E	
Eosin Y	R
Eriochrome Black T	R
Ether	R
Ethyl Acetate	R
Ethyl Acetoacetate	R
Ethyl Acrylate	R
Ethyl Alcohol	R
Ethyl Benzene	C
Ethyl Chloride	N
Ethyl Chloroacetate	N
Ethylene Bromide	N
Ethylene Chloride	N
Ethylene Chlorohydrin	N
Ethylenediamine	R
Ethylene Dichloride	N
Ethylene Glycol	C
Ethylene Oxide	R

CHEMICAL	RATING
Ethyl Ether	R
Ethyl Formate	R
Ethylene Glycol	R
2- Ethylhexanol	R
Ethyl Mercaptan	R
Ethyl Oxalate	R
F	
Fast Green FCF	R
Fatty Acids	R
Fehlings solution A	R
Fehlings solution B	R
Ferric Ammonium Sulfate	R
Ferric Chloride	R
Ferric Hydroxide	R
Ferric Nitrate	R
Ferric Sulfate	R
Ferrous Chloride	R
Ferrous Hydroxide	R
Ferrous Nitrate	R
Ferrous Sulfate	R
Fish Oil	R
Fluoboric Acid	R
Fluorine Gas (Dry)	R
Fluorine Gas (Wet)	R
Fluosilicic Acid 30%	R
Fluosilicic Acid 50%	R
Flormaldehyde Dilute	R
Flormaldehyde 35%	R
Flormaldehyde 37%	R
Flormaldehyde 50%	C
Formic Acid	R
Freon	R
Freon 12	R
Freon 21	—
Freon 22	R
Freon 113	C
Freon 114	—
Fructose	R
Furfural	R
G	
Gallic Acid	R
Gasoline	R
Gasohol	R
Gelatin	R
Glauber's Salt	—
Glucose	R
Glue, PVA	R
Glutathione	R
Glycerine	R
Glycine	R
Glycogen	R
Glycol	C
Glycol Amine	—
Glycolic Acid	R
Glyoxal	R
Grape Sugar	R
Grease	—
Green Liquor	R
H	
Heptane (Type 1)	R
n-Hexane	R
Hexamethylenediamine	R
Hexanol, Tertiary	R
Hydraulic Oil	—
Hydrazine	R
Hydrobromic Acid 20%	R
Hydrobromic Acid 50%	R
Hydrochloric Acid 10%	R
Hydrochloric Acid 30%	R
Hydrocyanic Acid	R
Hydrofluoric Acid Dilute	R
Hydrofluoric Acid 30%	R
Hydrofluoric Acid 50%	R
Hydrofluoric Acid 100%	R
Hydrofluosilic Acid 50%	R
Hydrogen	R
Hydrogen Cyanide	R
Hydrogen Fluoride	C
Hydrogen Peroxide 50%	R
Hydrogen Peroxide 90%	R
Hydrogen Phosphide	R

CHEMICAL	RATING
Hydrogen Sulfide Dry	R
Hydrogen Sulfide Wet	R
Hydrogen Sulfide, aqueous	R
Hydroquinone, aqueous	R
Hydroxylamine Hyrochloride	R
Hydroxylamine Sulfate	R
Hypochlorous Acid	R
I	
Indigo Carmine	R
Inks	R
Iodine	R
Iodine solution, Lugol's	R
Iron Phosphate	—
Isobutane	C
Isobutyl Alcohol	R
Isooctane	R
Isopropyl Acetate	R
Isopropyl Alcohol	R
Isopropyl Chloride	N
Isopropyl Ether	R
Isophorone	R
J	
Janus Green	R
JP-3 Fuel	R
JP-4 Fuel	R
JP-5 Fuel	R
JP-6 Fuel	R
K	
Kerosene	R
Ketchup	R
Kraft Liquors	R
L	
Lactic Acid 25%	R
Lactic Acid 80%	R
Lactose	R
Lard Oil	C
Latex	—
Lauric Acid	R
Lauryl Chloride	R
Lead Acetate	R
Lead Chloride	R
Lead Nitrate	R
Lead Sulfate	R
Lemon Oil	R
Ligroin	R
Limonene	R
Lime Slurry	R
Lime Sulfur	R
Linoleic Acid	C
Linoleic Oil	—
Linseed Oil	C
Liqueurs	R
Lithium Bromide	R
Lithium Carbonate	R
Lithium Chloride	R
Lithium Hyrdroxide 50%	R
Lithium Nitrate	R
Lithium Sulfate	R
Lubricating Oil #1	R
Lubricating Oil #2	R
Lubricating Oil #3	R
Ludox	—
Luminol 3-amino Phthalhydrazide	R
DL-lysine Hydrochloride	R
Lysozyme	R
M	
Magnesium Acetate	R
Magnesium Bromide	R
Magensium Carbonate	R
Magnesium Chloride	R
Magnesium Citrate	R
Magnesium Fluoride	—
Magnesium Hydroxide	R
Magnesium Nitrate	R
Magnesium Oxide	—
Magnesium Sulfate	R
Malachite Green	R

CHEMICAL	RATING
Maleic Acid	R
Malic Acid	R
Maltose	R
Manganese Chloride	R
Manganese Nitrate	R
Manganese Sulfate	R
Menthol	R
Mercuric Chloride	R
Mercuric Cyanide	R
Mercuric Sulfate	R
Mercurous Nitrate	R
Mercury	R
Methane	R
Methanol	R
DL-methionine	R
Methoxyethyl Oleate	—
Methyl Acetate	R
Methyl Acetone	R
Methyl Acrylate	—
Methyl Amine	R
Methyl Bromide	N
Methyl Cellosolve	R
Methyl cellulose	R
Methyl Chloride	N
Methyl Chloroform	N
Methyl Ethyl Ketone	R
Methyl Formate	R
Methyl Green	R
Methyl Isobutyl Carbinol	R
Methyl Isobutyl Ketone	R
Methyl Isopropyl Ketone	R
Methyl Methacrylate	R
Methyl Red	R
Methyl Sulfate	R
Methyl Violet-2B	R
Methyl Violet-6B	R
Methylene Blue	R
Methylene Bromide	N
Methylene Chloride	N
Methylene Chlorobromide	N
Methylene Iodine	N
Methysulfuric Acid	R
Milk	R
Mineral Oil	R
Molasses	R
Monochloroacetic Acid	R
Monochlorobenzene	N
Monoethanolamine	R
Monosodium Glutamate	R
Motor Oil	R
Morpholine	R

N

CHEMICAL	RATING
Naphtha	R
Naphthalene	C
Natural Gas	R
Neutral Red	R
Nickel Acetate	R
Nickel Ammonium Sulfate	—
Nickel Chloride	R
Nickel Nitrate	R
Nickel Sulfate	R
Nicotine	R
Nicotinic Acid	R
Nitric Acid 10%	R
Nitric Acid 30%	R
Nitric Acid 40%	R
Nitric Acid 50%	R
Nitric Acid 70%	R
Nitric Acid 100%	R
Nitrobenzene	N
Nitroethane	C
Nitrogen Gas	—
Nitroglycerine	C
Nitroglycol	—
Nitromethane	C
Nitrous Acid	R
Nitrous Oxide	R

O

CHEMICAL	RATING
n-Octane	C
Octanol	R
Oleic Acid	R
Oleum	R
Olive Oil	C
Orange G - acid orange 10	R
Orange IV - acid orange 5	R
Orcinol	R
Osmium Tetroxide	R
Oxalic Acid	R
Oxygen Gas	R
Ozone	R
Ozonized Water	R

P

CHEMICAL	RATING
Palm Oil	R
Palmitic Acid 10%	R
Palmitic Acid 70%	R
Pancreatin	R
Papain	R
Paraffin	R
Peanut Oil	C
Pectin	R
n-Pentane	C
Pepsin	R
Peracetic Acid	R
Perchloric Acid 15%	R
Perchloric Acid 70%	R
Perchloroethylene	C
Periodic Acid	R
Perphosphate	R
Phenol	R
Phenolphthalein	R
Phenyl Salicylate	R
Phenylhydrazine	C
Phosphate Esters	—
Phosphoric Acid 10%	R
Phosphoric Acid 50%	R
Phosphoric Acid 85%	R
Phosphoric Anhydride	R
Phosphorous (Red)	C
Phosphorous (Yellow)	C
Phosphorous Pentoxide	R
Phosphorous Trichloride	R
Photographic Solutions	R
Phthalic Acid	R
Picric Acid	R
Pine Oil	C
Plating Solutions Brass	R
Plating Solutions Cadium	R
Plating Solutions Chrome	R
Plating Solutions Copper	R
Plating Solutions Gold	R
Plating Solutions Lead	R
Plating Solutions Nickel	R
Plating Solutions Rhodium	R
Plating Solutions Silver	R
Plating Solutions Tin	R
Plating Solutions Zinc	R
Polyvinyl Acetate	—
Polyvinyl Alcohol	R
Potash	R
Potassium Acetate	R
Potassium Alum	R
Potassium Aluminum	R
Potassium Bicacbonate	R
Potassium Bichromate	R
Potassium Bisulfate	R
Potassium Bitartrate	R
Potassium Borate	R
Potassium Bromate	R
Potassium Bromide	R
Potassium Carbonate	R
Potassium Chlorate	R
Potassium Chloride	R
Potassium Chromate	R
Potassium Citrate	R
Potassium Cyanide	R
Potassium Dichromate	R
Potassium Ethyl Xanthate	—
Potassium Ferricyanide	R
Potassium Ferroycanide	R
Potassium Fluoride	R
Potassium Hydrogen Phosphate	R
Potassium Hydrogen Phthalate	R
Potassium Hydroxide	R
Potassium Hyprochlorite	R
Potassium Iodate	R
Potassium Iodide	R
Potassium Nitrate	R
Potassium Nitrite	R
Potassium Perborate	R
Potassium Perchlorate	R
Potassium Permanganate 10%	R
Potassium Permanganate 25%	R
Potassium Persulfate	R
Potassium Phosphate	R
Potassium Sodium Tartrate	R
Potassium Sulfate	R
Potassium Sulfide	R
Potassium Sulfite	R
Potassium Thiocyanate	R
Propane	R
Propargyl Alcohol	R
Propionic Acid	R
Propyl Acetate	—
Propyl Alcohol	R
N-Propyl Bromide	—
Propylene Dichloride	N
Propylene Glycol	R
Propylene Oxide	R
Pyridine	R
Pyrogallic Acid	R
Pyrrole	R

Q

CHEMICAL	RATING
Quinine Sulfate	R
Quinine Chloride Dihydrate	R
Quinone	—

R

CHEMICAL	RATING
Rayon Coagulating Bath	R
Rennin	R
Resazurin	R
Ringers Solution	R
Rose Bengal Acid Red 94	R

S

CHEMICAL	RATING
Safranin O	R
Salicylaldehyde	N
Salicylic Acid	R
Selenic Acid, Aq.	R
Silicic Acid	R
Silicone Oil	R
Silver Acetate	R
Silver Chloride	R
Silver Cyanide	R
Silver Nitrate	R
Silver Sulfate	R
Soaps	R
Sodium Acetate	R
Sodium Alum	R
Sodium Aluminate	R
Sodium Arsenate	R
Sodium Benzoate	R
Sodium Bicarbonate	R
Sodium Bichromate	R
Sodium Bisulfate	R
Sodium Bisulfite	R
Sodium Borate	R
Sodium Bromide	R
Sodium Carbonate	R
Sodium Chlorate	R
Sodium Chloride	R
Sodium Chlorite	R
Sodium Chromate	R
Sodium Citrate	R
Sodium Cyanide	R
Sodium Dichromate	R
Sodium Diphenylamine Sulfonate	R
Sodium Dithionite	R
Sodium Ferricyanide	R
Sodium Ferrocyanide	R
Sodium Fluoride	R
Sodium Hexametaphosphate	R
Sodium Hydroxide 15%	R
Sodium Hydroxide 30%	R
Sodium Hydroxide 50%	R
Sodium Hydroxide 70%	R
Sodium Hypochlorite	R
Sodium Iodate	R
Sodium Iodide	R
Sodium Metabisulfite	R

CHEMICAL	RATING
Sodium Metaphosphate	R
Sodium Nitrate	R
Sodium Nitrite	R
Sodium Palmitrate	R
Sodium Perborate	R
Sodium Perchlorate	R
Sodium Periodate	R
Sodium Peroxide	R
Sodium Phosphate Acid	R
Sodium Phosphate Alkaline	R
Sodium Phosphate Neutral	R
Sodium Propionate	R
Sodium Silicate	R
Sodium Sulfate	R
Sodium Sulfide	R
Sodium Sulfite	R
Sodium Thiousulphate	R
Sour Crude Oil	R
Soybean Oil	C
Stannic Chloride	R
Stannous Chloride	R
Stannous Sulfate	R
Starch	R
Stearic Acid	R
Streptomycin Sulfate	R
Strontium Bromide	R
Strontium Chloride	R
Styrene	N
Succinic Acid	R
Sugar	R
Sulfamic Acid	R
Sulfate Liquors	R
Sulfite Liquors	R
Sulfur	R
Sulfur Chloride	R
Sulfur Dioxide Gas Dry	R
Sulfur Dioxide Gas Wet	R
Sulfur Trioxide Gas Dry	—
Sulfur Trioxide Gas Wet	N
Sulfuric Acid Up to 30%	R
Sulfuric Acid 50%	R
Sulfuric Acid 60%	R
Sulfuric Acid 70%	R
Sulfuric Acid 80%	R
Sulfuric Acid 90%	R
Sulfuric Acid 93%	R
Sulfuric Acid 94%	R
Sulfuric Acid 95%	R
Sulfuric Acid 96%	R
Sulfuric Acid 98%	R
Sulfuric Acid 100%	R
Sulfurous Acid	R

T

CHEMICAL	RATING
Tall Oil	R
Tannic Acid	R
Tanning Liquors	R
Tar	C
Tartaric Acid	R
Terpineol	—
Tetrachloroethane	N
Tetrachloroethylene	N
Tetracycline hydrochloride	
Tetraethyl Lead	R
Tetrahydrofuran	R
Tetralin	N
Thiamine Hydrochloride	R
Thionin	R
Thionyl Chloride	R
Thymol	R
Titanium Dioxide	R
Titanium Tetrachloride	R
Toluene	C
Tomato Juice	R
Transformer Oil	R
Transformer Oil DTE/30	R
Tributyl Citrate	—
Tributyl Phosphate	R
Trichloroacetic Acid	R
Trichloroethylene	N
Triethanolamine	R
Triethylamine	R
Trimethylpropane	R
Trisodium Phosphate	R
Trypsin	R
Tung Oil	C
Turpentine	C

U

CHEMICAL	RATING
Urea	R
Urease	R
Urine	R

V

CHEMICAL	RATING
Varnish	—
Vaseline	C
Vegetable Oil	C
Vinegar	R
Vinyl Acetate	R

W

CHEMICAL	RATING
Water, Acid Mine	R
Water, Deionized	R
Water, Distilled	R
Water, Potable	R
Water, Salt	R
Water, Sea	R
Water, Soft	R
Water, Waste	R
Whiskey	R
White Liquor	R
Wine	R

X

CHEMICAL	RATING
Xylene	C

Z

CHEMICAL	RATING
Zinc Acetate	R
Zinc Carbonate	R
Zinc Chloride	R
Zinc Nitrate	R
Zinc Stearate	R
Zinc Sulfate	R

Chemicals Not Recommended for Use with CPVC Piping by the Piping Industry, But Found to be Compatible in DWV Applications

CHEMICAL

-A-
Acetaldehyde
Acetic Acid glacial
Acetic Anhydride
Acetone 100%
Acetyl Chloride
Acetylnitrile
Acrylic Acid
Acrylonitrile
Ammonia Gas
Ammonia Liquid
Ammonium Hydroxide
Amyl Acetate
Amyl Chloride
Aniline
Aniline Chlorohydrate
Aniline Hydrochloride

-B-
Benzaldehyde
Benzene
Benzyl Alcohol
Bromine Liquid
Butadiene
Butyl Acetate
Butyl Cellosolve
Butyric Acid 100%

-C-
Carbon Disulfide
Cellosolve
Cellosolve Acetate
Chloramine
Croton Aldehyde
Cumene
Cyclohexane
Cyclohexanol
Cyclohexanone

-D-
Diacetone Alcohol
Dichlorobenzene
Diethylamine
Dimethylamine
Diethyl Ether
Dimethyl Formamide
Dioxane

-E-
Ether
Ethyl Acetate
Ethyl Acetoacetate
Ethyl Acrylate
Ethyl benzene
Ethyl Ether
Ethylenediamine
Ethylene Oxide

CHEMICAL

-F,G-
Furfural
Gasoline
Gasohol

-H,I-
Hydrofluoric Acid 100%
Hydrazine
Isopropyl Acetate
Isopropyl Ether

-L-
Lemon Oil
Lemonene

-M-
Methanol 100%
Methyl Acetate
Methyl Amine
Methyl Cellosolve
Methyl Ethyl Ketone
Methyl Isobutyl Carbinol
Methyl Isobutyl Ketone
Methyl Isopropyl Ketone
Methyl Methacrylate
Monoethanolamine

-N,O-
Naphthalene
Nitroglycerine
Oleum

-P-
Palm Oil
Peracetic Acid
Phenylhydrazine
Phosphorous Trichloride
Picric Acid
Pine Oil
Propionic Acid
Propylene Oxide
Pyridine

-S,T-
Soybean Oil
Tar
Tetrahydrofuran
Thionyl Chloride
Toluene
Tributyl Phosphate
Turpentine

-V-
Vaseline
Vinyl Acetate

-X-
Xylene